Document Type: EA-Administrative Record
Index Field: Final Environmental Document
Project Name: Center Point–Moss Lake, GA, 230-kV TL
Project Number: 2005-21

ENVIRONMENTAL ASSESSMENT

CENTER POINT-MOSS LAKE 230/115-KV TRANSMISSION LINE AND MOSS LAKE SUBSTATION

Gordon and Whitfield Counties, Georgia

TENNESSEE VALLEY AUTHORITY

AUGUST 2007

Page intentionally blank

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

Page intentionally blank

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

#	Number
A.D.	Latin term, *anno Domini*, meaning “in the year of our Lord”
APE	Area of Potential Effect
B.C.	Before Christ
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DWSWA	Dalton-Whitfield Regional Solid Waste Management Authority
e.g.	Latin term, *exempli gratia*, meaning “for example”
EMF	Electric and Magnetic Fields
EO	Executive Order
et al.	Latin term, *et alii* (masculine), *et aliae* (feminine), or *et alia* (neutral), meaning “and others”
etc.	Latin term *et cetera,* meaning “and other things” “and so forth”
GIS	Geographic Information System
GDNR	Georgia Department of Natural Resources
HUC	Hydrologic Unit Code
I-	Interstate Highway
ibid	Abbreviation for the Latin term, *ibidem*, meaning “in the same place;” refers to the immediately preceding author or work cited
ID	Identification
i.e.	Latin term, *id est,* meaning “that is”
ITS	Integrated Transmission System
kV	Kilovolt
MW	Megawatt
n.d.	No Date (pertains to date Web site was accessed)
NEPA	National Environmental Policy Act
NGEMC	North Georgia Electric Membership Corporation
NPS	National Park Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
OSHA	Occupational Safety and Health Administration
PSO	TVA’s Power System Operations
RCRA	Resource Conservation and Recovery Act
RM	River Mile
ROW	Right-of-way
SF^6	Sulfur Hexafloride
SHPO	State Historic Preservation Officer
SMZ	Streamside Management Zone
sp.	Species
SR	State Route
TVA	Tennessee Valley Authority
TVARAM	TVA Rapid Assessment Method, a version of the Ohio Rapid Assessment Method designed specifically for the TVA region
US	U.S. Highway
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Page intentionally blank

CHAPTER 1

1. PURPOSE OF AND NEED FOR ACTION

1.1. Proposed Action: Improve Power Supply

Tennessee Valley Authority's (TVA) proposed action is to build a new substation in Gordon County, Georgia, adjoining North Georgia Electric Membership Corporation's (NGEMC) Moss Lake Substation near Calhoun (Figure 1-1). Additionally, TVA would construct approximately 15.5 miles of double-circuit transmission line in Gordon and Whitfield counties, Georgia, which would connect TVA's Center Point 230-kV Substation with the proposed Moss Lake Substation (Figure 1-1). The transmission line would be comprised of both a 230-kilovolt (kV) circuit and a 115-kV circuit supported on the same set of structures. The proposed transmission line would be built on approximately 3.3 miles of TVA's vacant right-of-way and 12.2 miles of new right-of-way 150 feet in width occupying approximately 306 acres. The proposed Moss Lake Substation would occupy approximately 5-6 acres (Figure 1-2). This project is planned to be built in stages over the next two to three years with a completion date of spring 2010.

TVA would also construct a connection from the proposed transmission line to NGEMC's Tilton Substation located adjacent to the proposed transmission line route.

Additional activities would be required within the existing Center Point Substation switchyard, including the construction of new line breaker bays and the installation of breakers and their associated control and communication equipment.

1.2. Need

NGEMC's load in south Whitfield and Gordon counties—between Dalton and Calhoun, Georgia—has grown by 42 percent in the last 10 years and is forecast to average 4 percent growth each year over the next decade. Approximately 180 megawatts (MW) of NGEMC's 566 MW load is served by a single line from the Georgia Integrated Transmission System (ITS). A portion of their service area (south of Dalton, Georgia) is served by their Tilton, Moss Lake, Butler, Gordon County Industrial Park, and Fuller substations around the Calhoun area. The Georgia ITS line that serves these substations has suffered extended outages in the past, including a 10-hour outage following a tornado. The transformers at NGEMC's Butler Substation in Calhoun exceeded their capacity in January 2003 by almost 20 MW. Because the Butler Substation is surrounded by development, it cannot be expanded or allow new circuits to be connected from new sources.

Removal of these NGEMC facilities from the Georgia ITS by connecting to the TVA transmission system would improve quality of service and overall reliability to both NGEMC and the Georgia ITS. Providing a connection would include the selection of a route, the purchase of the necessary easement rights for a 230/115-kV transmission line to connect TVA and NGEMC facilities in the Calhoun area to the TVA 230/115-kV Center Point Substation south of Dalton, and the construction of a transmission line and substation.

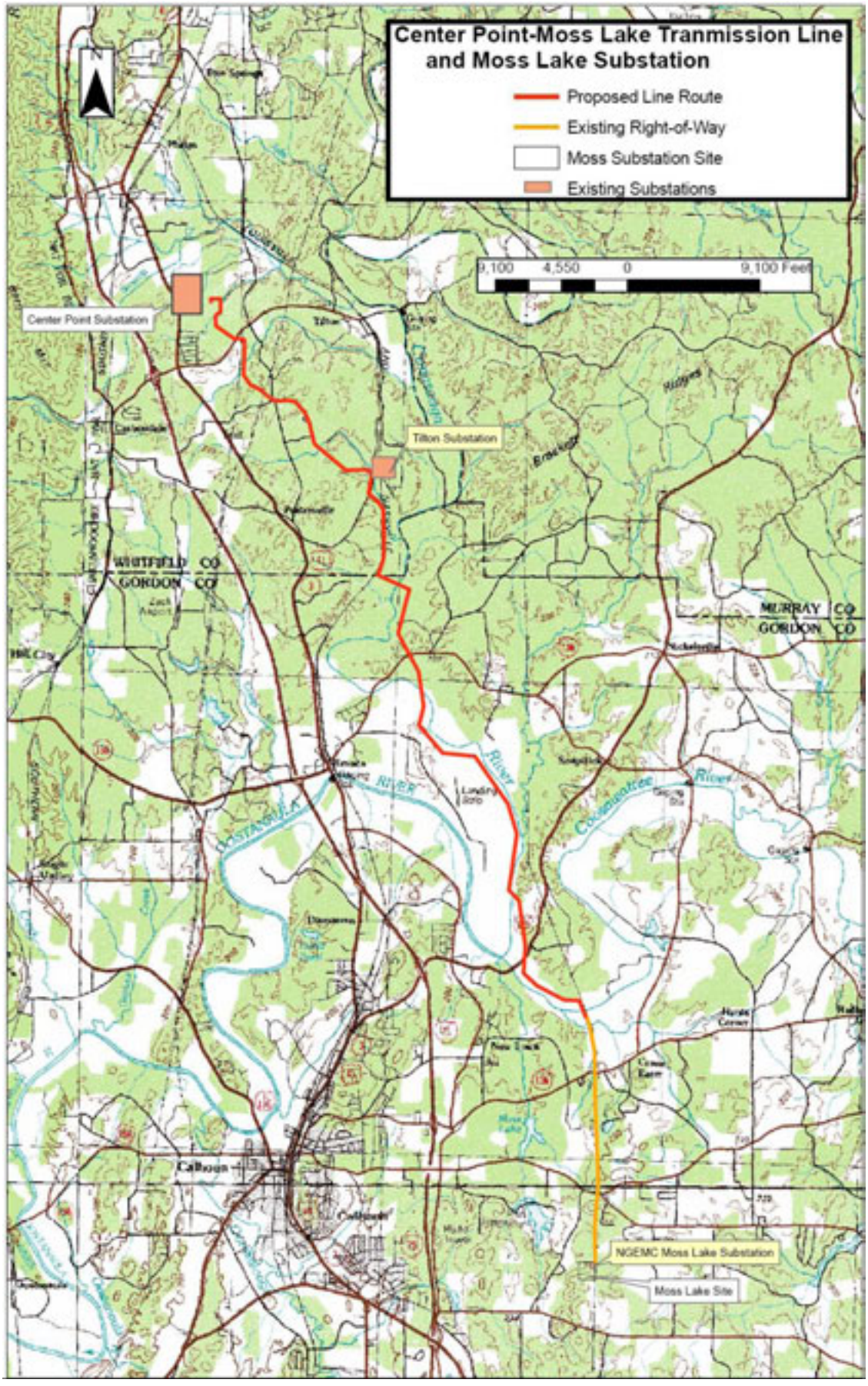

Figure 1-1. The Preferred Route for the Proposed Center Point-Moss Lake Transmission Line and Moss Lake Substation in Gordon and Whitfield Counties, Georgia

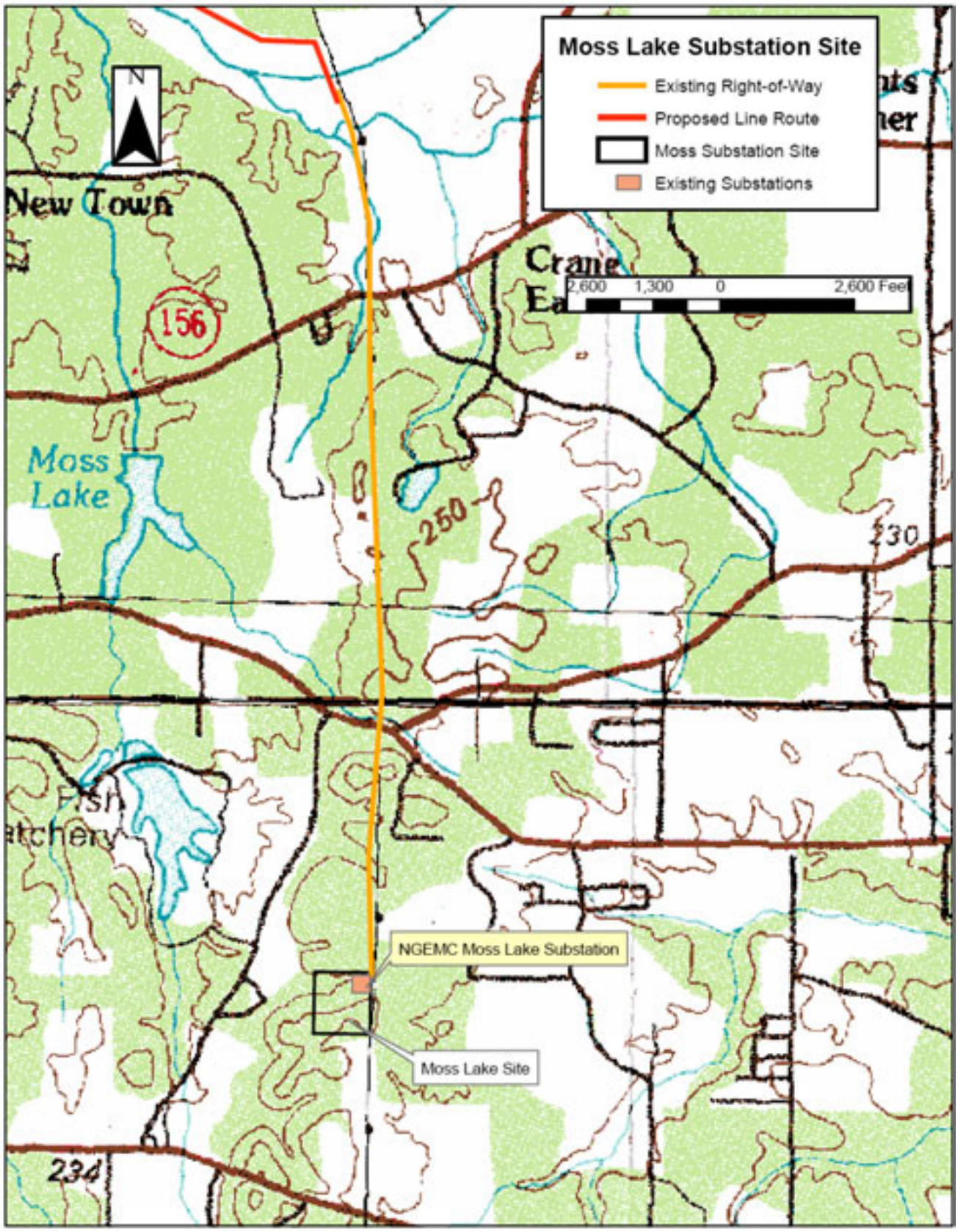

Figure 1-2. Proposed Moss Lake Substation Site in Gordon County, Georgia

The completion of this transmission line would help to relieve overloading at the NGEMC substations and increase reliability of the NGEMC load. It would also move 101 MW of load from the Georgia ITS to the TVA system, resulting in an upgrading of the reliability of NGEMC service by supplying its power requirements from TVA facilities. Georgia ITS would continue to supply its current customers.

The NGEMC Moss Lake Substation operates at 115-kV, so the completion of the Moss Lake Substation is needed to convert the 230-kV power supply to 115-kV for use to NGEMC's distribution lines.

1.3. Decisions

The primary decision before TVA is whether to improve the electrical service in the NGEMC service area by building a new 230/115-kV substation near Calhoun, Georgia, and a double-circuit transmission line to connect that station to the existing Center Point and Tilton substations. If the facilities are built, other secondary decisions are involved. These include the following considerations:

- The timing of improvements
- The best route for a transmission line
- Determining any necessary mitigation and/or monitoring measures to implement to meet TVA standards and minimize potential damages to resources

1.4. Public Involvement

The following federal, state, and local agencies have been contacted to date by TVA concerning this project:

- Dalton-Whitfield Regional Solid Waste Management Authority
- Eastern Band of the Cherokee Indians
- Georgia Department of Natural Resources
- Georgia State Historic Preservation Office
- Georgia State Representatives from the study area
- New Echota Cherokee Foundation
- U.S. Army Corps of Engineers, Savannah District
- U.S. Congressmen from the study area
- U.S. Fish and Wildlife Service
- U.S. National Park Service

TVA held a public meeting in Calhoun, Georgia, on October 7, 2003, to present two potential corridor alternatives with 29 separate possible new right-of-way segments for this project (Figure 1-3).

Public officials and about 1,000 potentially affected property owners within these corridors were specifically invited to the meeting. TVA also invited other interested members of the public through newspaper advertisements and local news outlets. Total public attendance at the meeting was about 150.

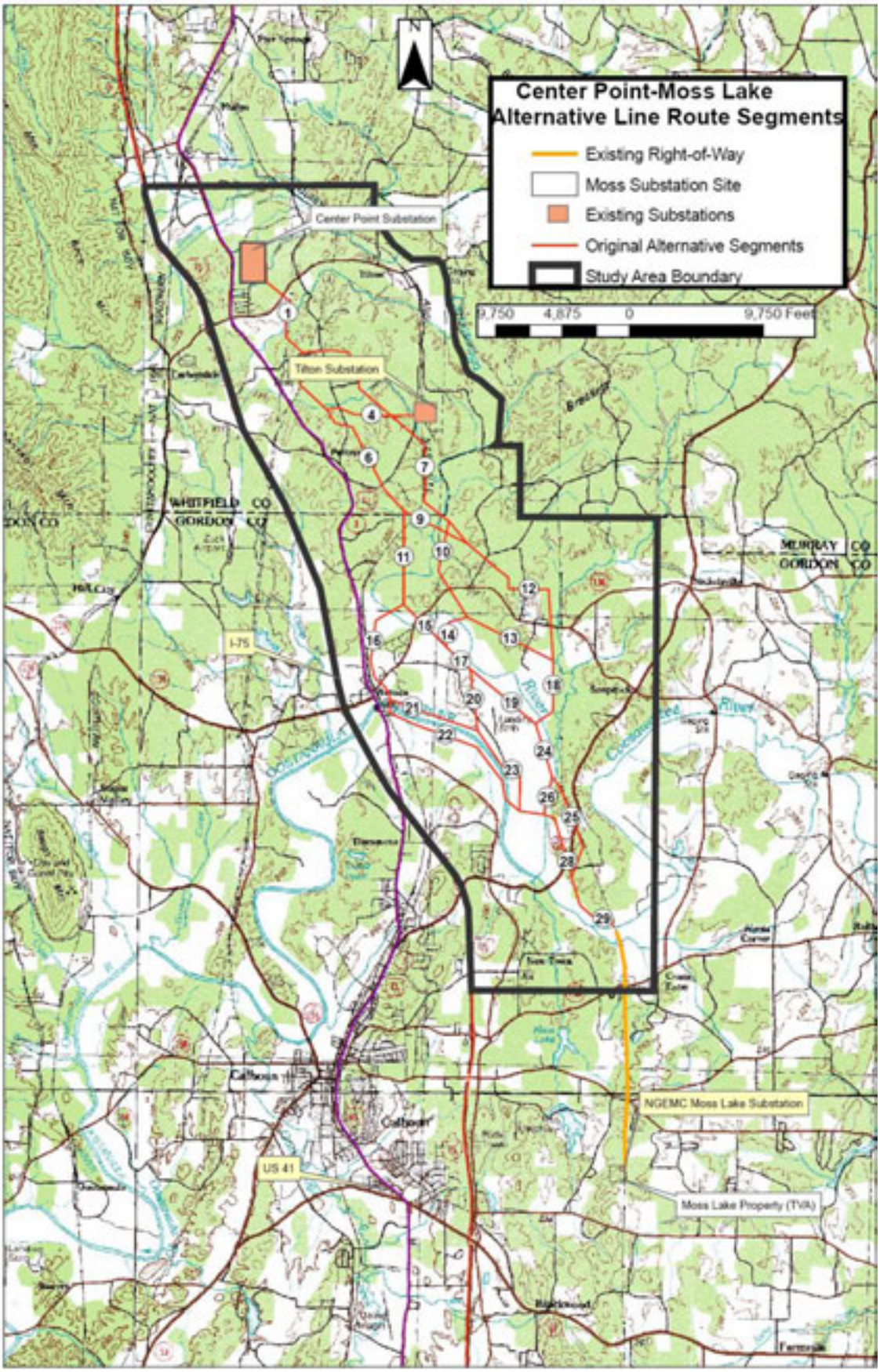

Figure 1-3. Proposed Alternative Route Segments for the Center Point-Moss Lake 230/115-kV Transmission Line in Gordon and Whitfield Counties, Georgia

During a 30-day public comment period following the open house, TVA accepted public comments on potential transmission line routes and other issues. A toll-free phone number and facsimile number were made available to facilitate comments. Many commenters provided information and land-use updates that enhanced TVA's understanding of route issues and usage constraints. Several comments were received, many relating to the historic nature of areas related to the Civil War Battle of Resaca, which occurred in May 1864.

This proposal was reviewed in accordance with Executive Order (EO) 11988 (Floodplain Management), EO 11990 (Protection of Wetlands), Farmland Protection Policy Act, National Historic Preservation Act, Endangered Species Act, Sections 401 and 404 of the Clean Water Act, and EO 12372 (Intergovernmental Review). Correspondence received related to this coordination is contained in Appendix I.

1.5. Necessary Permits or Licenses

Several federal, state, and local laws and regulations could apply to one or more of the alternatives considered in this environmental assessment. Compliance with these laws and regulations may require TVA or its contractors to be issued permits or be granted specific approvals. The need for TVA to obtain easements or licenses for transmission line rights-of-way is described above in Section 1.2. Other applicable permits and approvals are described below, organized by environmental resource area.

1.5.1. Highway Crossings

Permits issued by state and/or local authorities could be required for transmission lines crossing highways.

1.5.2. Water Quality

TVA would be required to obtain a National Pollutant Discharge Elimination System storm water runoff permit before site preparation and construction activities can begin. This permit is issued by the state of Georgia. TVA's Transmission Line Construction organization would prepare the required erosion and sedimentation control plans and coordinate these plans with the appropriate state and local authorities.

1.5.3. Wetlands and Streams

Before dredged or fill material is placed in wetlands and streams, a permit must be obtained from the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. EO 11990 directs federal agencies to avoid impacting wetlands to the extent practicable or to otherwise minimize potential wetland impacts.

1.5.4. Endangered Species

Under the Endangered Species Act, federal agencies are to ensure that their actions are not likely to jeopardize the continued existence of any federally listed as endangered or threatened species or to adversely modify any designated critical habitat of such species. If a proposed action may affect an endangered or threatened species, the agency must consult with the U.S. Fish and Wildlife Service (USFWS) and obtain that agency's determination of the potential for impacting these species.

CHAPTER 2

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1. Introduction

A description of the various alternatives considered is provided in this chapter. Additional background information about transmission line and substation construction, operation, and maintenance is also provided. This chapter has the following five major sections:

- Description of Alternatives
- Alternatives Eliminated From Detailed Study
- Description of Construction, Operation, and Maintenance of the Existing and Proposed 230/115-kV Transmission Line and Substation
- Project and Siting Alternatives
- Identification of the Preferred Alternative

This chapter describes all of the alternatives explored and provides a detailed description of the necessary steps in constructing a transmission line and substation.

2.2. Description of Alternatives

2.2.1. Alternative 1 - Do Not Build Additional Transmission Facilities (No Action)

Under the No Action Alternative, TVA would not construct a new substation or 15.5 miles of new transmission line. As a result, portions of the Georgia ITS that supply NGEMC in south Whitfield and Gordon counties would continue to operate with a high risk level of interruption in certain situations, especially at times of high electricity use. This risk is projected to increase over time as the electrical loads in the area grow due to ongoing and already planned development. Reliability of service may be jeopardized, and extended outages may occur in the area. The Butler Substation has already experienced periods of exceeded capacity and cannot be expanded due to space limitations. Without a new 230/115-kV substation and new transmission line connected to the TVA transmission system, these increasing power loads would not be sustained by this or other NGEMC substations.

Additional transmission capacity is needed to address the increase in load that has occurred and is occurring. NGEMC could decide to build the transmission line and substation itself and connect to the Georgia ITS. If it did so, the potential impacts resulting from the implementation of the No Action Alternative would be similar to those of the Action Alternative that are described in Chapter 4, and perhaps more severe depending on the route chosen and the construction methods used by NGEMC. Should Georgia ITS construct the facilities, costs to both the TVA and NGEMC systems would be higher. Additionally, because the majority of the current load demand is being served from one line, upgrading the existing NGEMC system would not provide a second power source to increase reliability and, therefore, the risk of outages due to supply line failure would not be solved. With these considerations, it was determined that this alternative would not address the reliability or capacity problems in the NGEMC service area.

2.2.2. Alternative 2 - Construct Moss Lake 230/115-kV Substation and Center Point-Moss Lake 230/115-kV Transmission Line (Action)

Under the Action Alternative, TVA would construct and operate two new transmission lines on one set of double-circuit structures occupying approximately 12.2 miles of new right-of way and about 3.3 miles of existing but vacant TVA right-of-way in Gordon and Whitfield counties, Georgia. The double-circuit transmission line would be built on right-of-way 150 feet wide. TVA would also construct a new substation that would occupy 5 to 6 acres adjacent to NGEMC's Moss Lake Substation on about 25 acres of existing TVA property. Additionally, a connection would be built between the proposed transmission line and NGEMC's Tilton Substation.

New substation bays and breakers, as well as their associated control and communication equipment, would be installed within the fenced area of the existing Center Point Substation switchyard. Some additional equipment modifications and alternations would also occur at Center Point. This alternative would meet the growing power needs in the south Whitfield and Gordon counties area by providing a new higher capacity source of power.

2.3. Alternatives Eliminated From Detailed Study

Besides Alternatives 1 and 2, TVA also considered other alternative solutions. The option to upgrade the existing transmission system was considered; however, the current load is being served from one transmission line, and a second source is needed to provide reliability for the NGEMC power load. Building the second transmission line from an alternative direction would provide another source of power in case of an outage on one of the transmission lines.

TVA also considered paralleling the existing Conasauga-Bowen 500-kV Transmission Line, but determined that this was not viable due to environmental constraints (wetlands) and impacts to existing residential homes in the area requiring relocations to widen the right-of-way.

2.4. Description of Construction, Operation, and Maintenance of the Existing and Proposed 230/115-kV Transmission Line

2.4.1. Transmission Line Construction

2.4.1.1. Right-of-Way Acquisition and Clearing

Approximately 3.3 miles of existing TVA right-of-way and 12.2 miles of new right-of-way 150 feet wide would be needed for the proposed transmission line that would be located between the existing Center Point Substation and TVA's proposed substation adjacent to NGEMC's Moss Lake Substation.

TVA would purchase easements from landowners for the new right-of-way on private land. These easements would give TVA the right to construct, operate, and maintain the transmission line, as well as remove danger trees off the right-of-way. Danger trees are those trees that are located away from the cleared right-of-way, but are tall enough to pass within 10 feet of a conductor or strike a structure should it fall toward the transmission line. Fee title, i.e., ownership, for the land within the right-of-way remains with the landowner, and a number of activities may be continued on the property by the landowner. However, the easement agreement prohibits certain activities such as the construction of buildings

and any other activities within the right-of-way that could interfere with the transmission line or create a hazardous situation.

The proposed project would require the removal of two houses located within the proposed transmission line right-of-way. Before removal, these houses would undergo a full evaluation to determine if they contain or are constructed with any material that is hazardous or otherwise regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), or other state or federal laws or regulations. If any such material is present, it would be handled and disposed of pursuant to the applicable regulations. The remaining material would be placed in an approved construction demolition landfill area.

Because of the need to maintain adequate clearance between tall vegetation and transmission line conductors, as well as to provide access for construction equipment, most trees and shrubs would be initially removed from the entire width of the right-of-way. Equipment used during this right-of-way clearing would include chain saws, skidders, bulldozers, tractors, and/or low ground-pressure feller-bunchers. Marketable timber would be salvaged where feasible; otherwise, woody debris and other vegetation would be piled and burned, chipped, or taken off site. In some instances, vegetation may be windrowed along the edge of the right-of-way to serve as sediment barriers.

Streamside management zones (SMZs) would be established along intermittent and perennial streams; their width would be based on stream characteristics, slope, soil types, and other factors (Muncy 1999). Vegetation removal in SMZs and wetlands would be restricted to trees tall enough, or with the short-term potential to grow tall enough, to interfere with conductors. Clearing in SMZs would be accomplished using hand-held equipment or remote-handling equipment, such as a feller-buncher, in order to limit ground disturbance. *TVA Right-of-Way Clearing Specifications*, *Environmental Quality Protection Specifications for Transmission Line Construction*, and *TVA Transmission Construction Guidelines Near Streams* (Appendices II, III, and IV) would be followed in clearing and construction activities.

Subsequent to clearing and construction, vegetative cover on the right-of-way would be restored as much as is possible to its state prior to construction. Pasture areas would be reseeded with suitable grasses. Wooded areas would be restored using native grasses and other low-growing species. Erosion controls would remain in place until the plant communities become fully established. Streamside areas would be revegetated as described in Appendices II through IV.

2.4.1.2. Access Roads

Temporary access roads would be needed to allow vehicle access to each structure and other points along the new right-of-way. Twelve access roads were identified along the proposed transmission line. The identified roads are primarily existing roads that include privately built, farm and field roads, some of which may need upgrading. Upgrading would consist of minor grading and placement of gravel.

Typically, the access roads are located on the right-of-way wherever possible and designed to avoid severe slope conditions and to minimize stream crossings. The roads are typically about 20 feet wide and surfaced with dirt or gravel. Along the new transmission line, TVA would obtain the necessary rights for these access roads from landowners.

Culverts and other drainage devices, fences, and gates would be installed as necessary. Culverts installed in any permanent streams would be removed following construction. However, in wet-weather conveyances (i.e., streams that run only following a rainfall), they would be left or removed, depending on the wishes of the landowner or on any permit conditions that might apply. If desired by the property owner, new temporary access roads would be restored to previous conditions. Additional applicable right-of-way clearing and environmental quality protection specifications are listed in Appendices II and IV.

2.4.1.3. Construction Assembly Areas

A construction assembly area (laydown area) would be required for worker assembly, vehicle parking, and material storage. This area would typically be 5 to 10 acres in size, previously cleared, relatively flat, and adjacent to a paved road near the proposed transmission line. The laydown area would be leased for the duration of the construction period. The area would be graveled and fenced, and trailers, used for material storage and office space, would be parked at this location. *Site Clearing and Grading Specifications* (Appendix V) would be followed in clearing and construction activities. Following the completion of construction activities, all trailers, unused materials, and construction debris would be removed from the site. Removal of the fence and restoration would be at the discretion of the landowner.

2.4.1.4. Structures and Conductors

The proposed 230-kV and 115-kV transmission line connection from the Center Point Substation to the Moss Lake Substation would be built primarily using H-frame steel-pole structures similar to that shown in Figure 2-1. Structure type and heights would vary according to the terrain and would range between 90 and 130 feet.

Figure 2-1. Double-Circuit, H-Frame Transmission Structure

Three conductors (the cables that carry the electrical current) are required to make up a circuit in alternating current transmission lines. For 230-kV and 115-kV transmission lines, each conductor is made up of a single cable. The conductors are attached to fiberglass or ceramic insulators suspended from the structure cross arms. A smaller overhead ground

wire(s) is attached to the top of the structures. This ground wire may contain fiber optic communication cables.

Poles at angles in the transmission line may require supporting guy wires. Some structures for larger angles could require two or three poles. Most poles would be imbedded directly in holes augured into the ground to a depth equal to 10 percent of the pole's length plus an additional 2 feet. The holes would normally be backfilled with the excavated material. In some cases, gravel or a cement and gravel mixture might be necessary. Some structures may be self-supporting (non-guyed) poles fastened to a concrete foundation that is formed and poured into an excavated hole.

Equipment used during the construction phase would include trucks, truck-mounted augers and drills, as well as tracked cranes and bulldozers. Low ground-pressure-type equipment would be used in specified locations (e.g., areas with soft ground) to reduce the potential for environmental impacts.

2.4.1.5. Conductor and Ground Wire Installation

Reels of conductor and ground wire would be delivered to various staging areas along the right-of-way. Temporary clearance poles would be installed at road and railroad crossings to reduce interference with traffic. Installation of conductors would begin with a small rope being pulled from structure to structure. This rope would then be connected to the conductor and ground wire and used to pull them down the line through pulleys suspended from the insulators mounted on the structures. A bulldozer and specialized tensioning equipment would be used to pull conductors and ground wires to the proper tension. Finally, the wires would be clamped to the insulators and the pulleys removed.

2.4.1.6. Substation Construction

The proposed TVA substation would be located on a 25-acre site immediately adjacent to NGEMC's Moss Lake Substation (Figures 1-1 and 1-2). The actual substation would occupy about 5-6 acres of the 25-acre site.

The substation site would be graded, drainage structures would be installed, and finally the site would be covered with crushed stone and enclosed with chain link fencing 7 feet in height. The unused portion of the site would be restored as much as possible to its preconstruction state.

The major equipment in the new substation would consist of multiple 230/115-kV disconnect switches, three SF^6 circuit breakers, associated bus work, associated relays communication, and control and protection equipment. The bus work, other conductors, and some equipment would be supported on steel structures. Environmental protection measures that would be applied during substation construction are listed in Appendix V.

2.4.2. Operation and Maintenance

2.4.2.1. Inspection

Periodic inspections of TVA's transmission lines are performed from the ground and by aerial surveillance using a helicopter. These inspections are conducted to locate damaged conductors, insulators, or structures, and to report any abnormal conditions that might hamper the normal operation of the line or adversely impact the surrounding area. During these inspections, the condition of vegetation within the right-of-way, as well as immediately adjoining the right-of-way, is noted. These observations are then used to plan corrective maintenance or routine vegetation management.

2.4.2.2. Vegetation Management

Management of vegetation along the right-of-way would be necessary to ensure access to structures and to maintain an adequate distance between transmission line conductors and vegetation. Management of vegetation along the right-of-way would consist of two different activities: the felling of danger trees adjacent to the cleared right-of-way, as described in Section 2.4.1.1, and the control of vegetation within the cleared right-of-way.

Management of vegetation within the cleared right-of-way would use an integrated vegetation management approach designed to encourage the low-growing plant species and discourage tall-growing plant species. A vegetation-reclearing plan would be developed for each transmission line segment based on the results of the periodic inspections described above. Given the land use in the area of this project, right-of-way maintenance is expected to be minimal. The two principal management techniques are mechanical mowing, using tractor-mounted rotary mowers, and herbicide application. Herbicides are normally applied in areas where heavy growth of woody vegetation is occurring on the right-of-way and mechanical mowing is not practical. Herbicides would be selectively applied by helicopter or from the ground with backpack sprayers or vehicle-mounted sprayers.

Any herbicides used would be applied in accordance with applicable state and federal laws and regulations and the commitments listed in this document. Only herbicides registered with the U.S. Environmental Protection Agency (USEPA) would be used. A list of the herbicides currently used by TVA in right-of-way management is presented in Appendix VI. This list may change over time as new herbicides are developed or new information on presently approved herbicides becomes available.

Other than vegetation management, little other maintenance work would normally be required. The transmission line structures and other components typically last several decades. In the event that a structure must be replaced, it would normally be lifted out of the ground by crane-like equipment, and the replacement structure would be inserted into the same hole or an immediately adjacent hole. Access to the structures would be on existing roads where possible. Replacement of structures may require leveling the area surrounding the replaced structures, but there would be little, if any, additional area disturbance when compared to the initial installation of the structure.

2.5. Project and Siting Alternatives

2.5.1. Substation Siting Alternatives

To best solve the system transmission problems in Whitfield and Gordon counties, the new substation would need to be located near the southern limit of the NGEMC service area to be easily connected into the existing NGEMC system.

In the mid 1990s, TVA purchased a parcel of land suitable for use as a substation site east of Calhoun, Georgia, adjacent to an existing transmission line corridor. This site was chosen because it was in an area that was undeveloped at the time and would be less visible from existing homes when compared to other possible sites. NGEMC subsequently built its Moss Lake 115-kV Substation on the northeast corner of this site, and it is currently served by a transmission line TVA constructed in 1996. Use of TVA's 25-acre property for the proposed substation would allow a direct connection to the NGEMC system, eliminating the need for an additional 115-kV transmission line.

In addition to the substation site, about 3.3 miles of transmission line right-of-way, 150 feet in width, was purchased that parallels an existing Georgia Power 500-kV transmission line and is located between the Moss Lake Substation site and the Coosawattee River to the

north. This right-of-way also extends in the general direction of the nearest direct connection into the TVA system, the Center Point Substation.

As well as meeting the location criteria, the substation site has no constraints that would adversely affect its use for a substation site, and the location meets all the relevant electrical system needs of the proposed project. A review of the U.S. Department of Agricultural Natural Resources Conservation Services soil survey for Gordon County indicated that prime farmland soils are not present in the area outlined for the proposed Moss Lake Substation (Bramlett 1965). Use of this site would avoid any purchase of privately held land for the substation and any related land-use conflicts. An additional consideration was that it would be preferable that the new substation be located west of the Woodlawn Substation because there would be difficulties in supporting the Woodlawn system load, under certain conditions, without a transmission line connection to Montgomery. In light of these factors, it is highly unlikely that any alternative substation site would be better in terms of fewer or lesser impacts or costs. Accordingly, no other substation sites were studied, and this is the preferred site for the new Moss Lake Substation.

2.5.2. Transmission Line Siting Alternatives

TVA's transmission line siting evaluation is used to identify reasonable transmission line route alternatives and to select a preferred route. The preferred route can then be further adjusted in response to comments TVA receives from landowners, other stakeholders, and officials during the public review. TVA's transmission line siting process is comprehensive and takes into account a large number of criteria, including potential environmental impacts to narrow down the typically large number of possible transmission line routes.

When TVA proposes to serve some location (a new substation as is the case here), it begins by identifying a study area and within that study area, transmission line route options or corridors. These corridors can be broad (miles wide). After assessing the feasibility of the identified corridors, the siting process typically rates one or two corridors as preferable options for routing the proposed transmission line, and further analysis of these corridors continues. TVA then identifies one or more feasible transmission line routes within the remaining corridors and presents these to the public.

As such, the process of siting the proposed transmission line adhered to the following basic steps used by TVA:

- Determine potential existing power sources to supply the substation.
- Define the study area.
- Collect data to minimize potential impacts to cultural and natural features.
- Develop general route options and potential routes.
- Gather public input.
- Incorporate public input into the final identification of the transmission line route.

2.5.2.1. Determination of Existing Power Sources

The first task in defining the study area was to identify a power source that could supply the identified objective. Transmission studies showed that the existing TVA Center Point 230/115-kV Substation south of Dalton was the only adequate source for connection to the TVA system. Additional considerations included that due to the poor reliability of the present transmission line connection, a new connection was needed to the Tilton Substation, and it appeared that future connections would be needed to serve growing loads in the Resaca, Georgia, area. Finally, NGEMC's Moss Lake Substation was a logical

terminus for any new transmission lines, since it was located near the southern limit of the NGEMC area to be served. TVA owned land and easement rights adjoining the Moss Lake Substation that could also be used to upgrade the area facilities in the future.

2.5.2.2. Definition of Study Area

Based on the transmission studies identifying the TVA Center Point 230/115-kV Substation as a viable power source, a study area project was developed to allow for the establishment of two or more corridors that would eventually yield a preferred transmission line route between the Center Point Substation and the proposed Moss Lake site. The study area was defined as an area that encompasses approximately 37 square miles or 23,680 acres and is located in parts of Whitfield and Gordon counties (Figure 1-3). The northern boundary was established as an east-west line between I-75 and the Conasauga River a short distance north of the Center Point Substation. The east boundary then follows the river in a south-southeast direction for about 2 miles to a point east of the Dow Chemical Plant where Whitfield, Gordon, and Murray counties intersect. This boundary then follows the county line between Gordon and Murray counties for a mile to the south then turns east for 2 miles. The boundary then turns south for 6.25 miles crossing State Routes (SR) 136 and 225, crosses the Coosawattee River three times, and terminates at a point on SR 156 in Gordon County. The south boundary then turns to the west for 2.6 miles to a point on I-75 just north of the SR 156 exit from I-75. The west boundary line follows I-75 from this point northward to the beginning point.

A geographic information system- (GIS) based routing map and color orthophotography were developed. The GIS data generated a “constraint” model that served to guide the siting process by identifying obvious routing conflicts or sensitive areas including, but not limited to, houses, rivers, historical sites, and wetlands. Following is a brief description of other aspects of the study area.

- *Transportation*: There are a number of major transportation features in this study area. I-75 constitutes the western edge of the study area. There are four interchanges along I-75. Additionally, the following highways cross the study area: U.S. Highway (US) 41 (in a north-south direction), SR 136, and SR 225 (connecting Calhoun to communities to the east). All are heavily used. There are various other county roads serving the Dow Chemical Plant and the Dalton-Whitfield Regional Solid Waste Management Authority (DWSWA).

- *Natural Features*: Available soil survey maps do not identify any soil types that would preclude routing a future transmission line anywhere in the study area. The predominant water features in the study area include the Conasauga, Oostanaula, and Coosawattee rivers. The Conasauga River borders the eastern study area boundary above the Gordon County line and then meanders through the center of the south half of the area. Before it merges with the Conasauga River, a small portion of the Coosawattee River is also within the study area. These two rivers merge within the study area to become the Oostanaula River, which turns north to exit the study area near the Resaca exit from I-75. Due to the existence of the three rivers, there were many wetlands within the study area of varying sizes.

- *Cultural Features*: There are numerous areas in the study area associated with Civil War activity including the Battle of Resaca. The community of Resaca is in the center portion of the study area lying 0.5 mile east of I-75. The entire area within 1- to 1.5-mile distance east and west of I-75 was said to have been a part of that battle at some level. The Resaca Confederate Cemetery is located just east of US 41

north of Resaca and the Chitwood Farm, an area used for Civil War reenactments is located between US 41 and the Conasauga River just south of the Gordon/Whitfield County line.

Archaeological sites would be better identified in a more detailed examination of the preferred route for the project. There is a significant historical site at the location of the Cherokee Memorial and Cherokee Nation headquarters at New Echota.

- *Land Use*: The land uses in the study area are extremely varied. In the northern area near the Center Point Substation south to Tilton Road, there are scattered residential tracts including Sherwood Forest Subdivision. The existing transmission line enters the study area from the Dalton area, and a heavily used railroad cuts through the northeast corner before turning south and crossing the entire study area before entering the northern city limits of Calhoun. The Dow Chemical Plant is located on East Nance Springs Road between the railroad and the Conasauga River. The Tilton Substation is northwest of and adjacent to the chemical plant. The DWSWA landfill occupies a large portion of land between Old Dixie Highway and East Nance Springs Road south of the Tilton community.

  There are small manufacturing businesses throughout the study area that are associated with the Dalton area carpet industry, mainly along the US 41 corridor. Residential development along all the state and county highways throughout the area is fairly complete.

  The floodplain areas of the three rivers are in agricultural use typified by sod farms, row crops, hay production, and pasturelands. There is a commercial hunting preserve and gun club located between East Nance Springs Road and the Conasauga River southeast of the Dow Chemical Plant.

  A 500-kV transmission line enters the study area from the south, crosses the Coosawattee River and follows a northern route between that river and the Conasauga River to the Gordon/Murray County line. This transmission line, owned by Georgia Power Corporation, connects Georgia Power's system and facilities to TVA's Sequoyah Nuclear Plant. A 150-foot-wide right-of-way from the Moss Lake Substation site northward to the crossing of the Coosawattee River and parallel to this transmission line was purchased by TVA in 1995. There is a 115-kV transmission line with a parallel 13-kV distribution line and a 230-kV transmission line in the northern portion of the study area. The 13-kV circuit presently serves NGEMC's Tilton Substation that serves the Dow Chemical Plant load.

2.5.2.3. Collect Data

Geographic data, such as topography, land use, transportation, environmental features, cultural resources, near-term future development, and land conservation information were collected for the entire study area. Analysis of the data was aided by using GIS. This system allowed the multitude of factors of the study area to be examined simultaneously to develop and evaluate numerous options and scenarios to determine the route or routes that would best meet project needs, including avoiding or reducing potential environmental impacts.

Maps were created to show regional opportunities and constraints clearly (Figure 2-2). Sources included 1 inch = 500 feet aerial photography, county tax maps/property

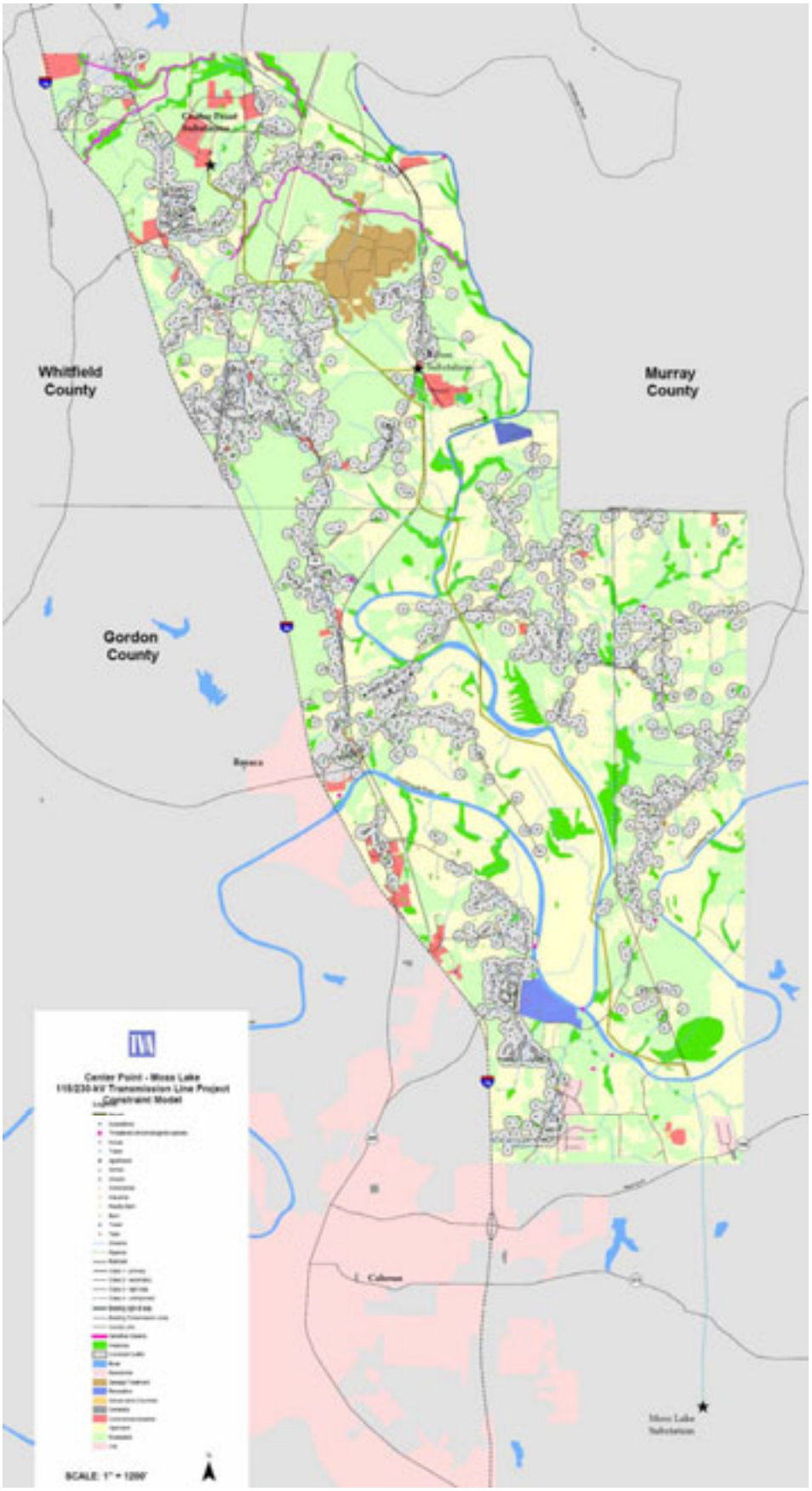

Figure 2-2. Constraint Map of the Study Area for the Center Point-Moss Lake 230/115-kV Transmission Line and Moss Lake Substation in Gordon and Whitfield Counties, Georgia

boundaries, U.S. Geological Survey (USGS) digital line graphs, digital elevation models, National Wetlands Inventory, and cultural resource data, among others. Aerial photography was interpreted to obtain land-use and land-cover data, such as forests, agriculture, wetlands, houses, barns, commercial and industrial buildings, churches, and cemeteries. Data were analyzed both manually and with GIS. Manual calculations from aerial photographs, tax maps, and other sources included the number of road crossings, stream crossings, and property parcels.

2.5.2.4. Develop General Route Options and Potential Transmission Line Routes

Possible transmission line route segments were developed utilizing data, which included current aerial photography of the study area, 7.5-minute USGS topographic maps, as well as a constraint model of the study area. The constraint maps were produced by interpretation of aerial photographs as well as a search of existing records of environmental, historical, and archaeological locations (Figure 2-2).

The straight-line distance from the Center Point Substation to TVA's existing vacant right-of-way north of the Moss Lake Substation site was 10.4 miles. That distance along with the width of the study area provided 29 practicable alternative transmission line segments that could be combined into a number of possible route options that could then be studied for the proposed project (Figure 2-3). These proposed route segments were provided to the public on October 7, 2003. Through various combinations of the alternative transmission line segments, a total of 14 transmission line route alternatives were possible between the Center Point Substation and proposed Moss Lake Substation site (Table 2-1).

Table 2-1. Alternative Routes for Proposed Transmission Line

Route Number	Segment Sections
1	1, 2, 4, 5, 6, 9, 12, 18, 24, 25, 29
2	1, 2, 4, 5, 6, 9, 12, 18, 24, 26, 28, 29
3	1, 2, 4, 5, 6, 11, 15, 17, 19, 24, 25, 29
4	1, 2, 4, 5, 6, 11, 15, 17, 19, 24, 26, 28, 29
5	1, 2, 4, 5, 6, 11, 15, 17, 20, 23, 27, 28, 29
6	1, 2, 4, 5, 6, 11, 16, 21, 23, 27, 28, 29
7	1, 2, 4, 5, 6, 11, 16, 22, 27, 28, 29
8	1, 3, 5, 7, 8, 12, 18, 24, 25, 29
9	1, 3, 5, 7, 8, 12, 18, 24, 26, 28, 29
10	1, 3, 5, 7, 10, 13, 18, 24, 25, 29
11	1, 3, 5, 7, 10, 13, 18, 24, 26, 28, 29
12	1, 3, 5, 7, 10, 14, 17, 19, 24, 25, 29
13	1, 3, 5, 7, 10, 14, 17, 19, 24, 26, 28, 29
14	1, 3, 5, 7, 10, 14, 17, 20, 23, 27, 28, 29

Segment 1 would begin slightly west of the southeast corner of the Center Point Substation property corner. The segment would then proceed in a south direction for about 7,500 feet through an undeveloped wooded area, cross Tilton Road in an undeveloped area, generally

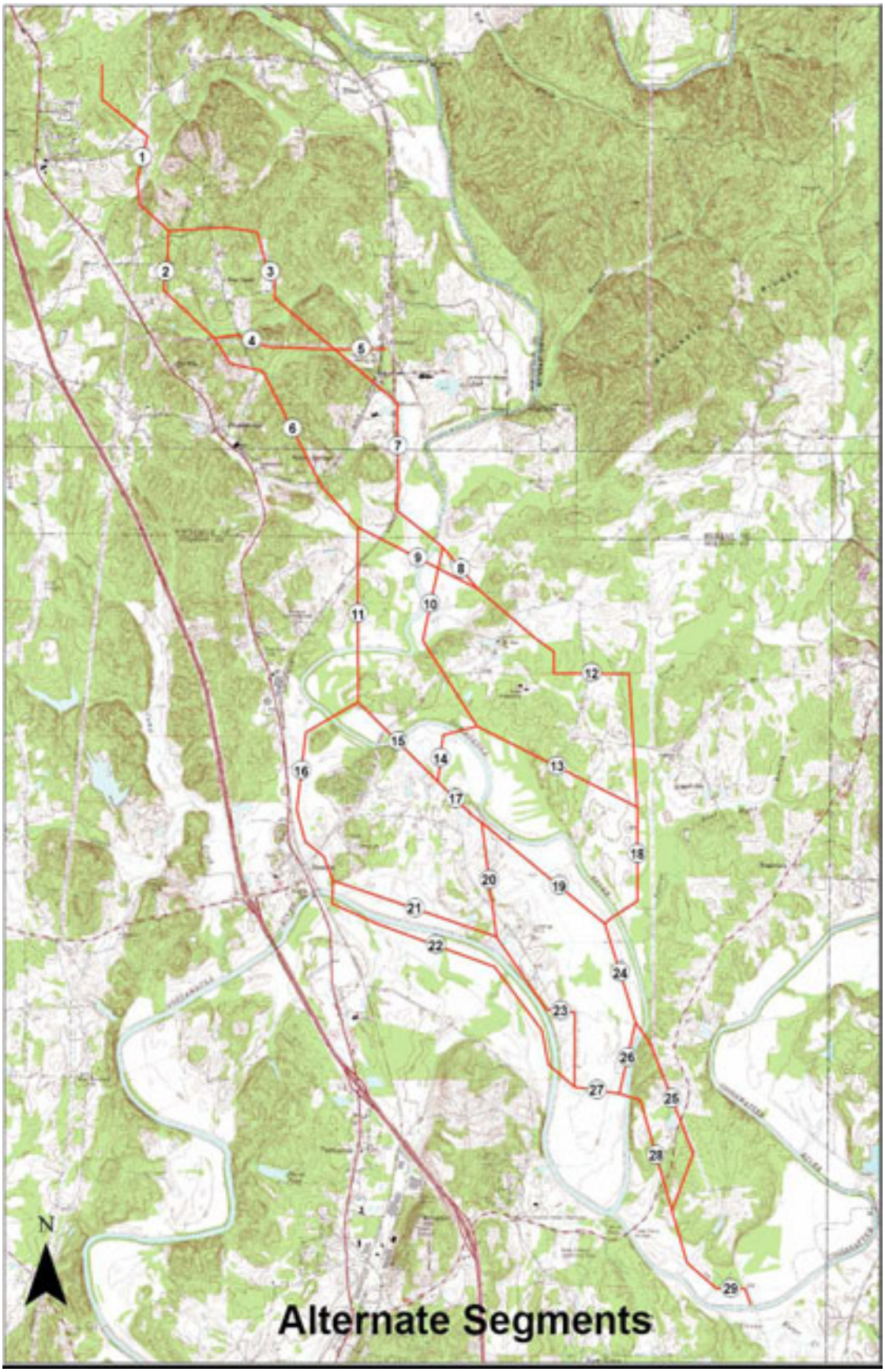

Figure 2-3. Alternative Route Segments for the Center Point-Moss Lake 230/115-kV Transmission Line and Moss Lake Substation in Gordon and Whitfield Counties, Georgia

follow the west side of a Georgia Power 115-kV transmission line, avoiding a wetland and sensitive stream area. The segment would then turn to the southeast, cross over the transmission line up to a point of beginning of Segments 2 and 3. Segment 1 would affect 14.5 acres of wooded areas and one watercourse crossing identified on the USGS topographic maps as a 'blue line stream'. Blue line streams in most cases are perennial streams, but are occasionally intermittent or wet-weather conveyance watercourses.

Segment 2 would turn south crossing a paved county road passing east of a house and childcare center. The segment would then turn southeast crossing over a Georgia Power 230-kV transmission line to the beginning of Segments 4 and 6. This segment, 0.9 mile long, would cross 14 acres of wooded area and one blue line stream.

Segment 3 would proceed eastward, cross Old Dixie Highway, turn southeast passing between the landfill property on the east and a subdivision on the west before terminating at the origin of Segment 5. This 1.6-mile segment would cross 22 acres of wooded land, two paved roads, and two blue line streams.

Segment 4 is 0.75 mile long and would follow an east path crossing Old Dixie Highway and paralleling a 115-kV transmission that serves the Tilton Substation. This segment would cross a small wetland and closely parallel a blue line stream. It would terminate at the beginning of Segment 5.

Segment 5 is 0.45 mile long and would parallel the 115-kV transmission line. This segment would effectively be the route for the proposed TVA 115-kV circuit that would eventually serve the NGEMC Tilton Substation after removal from the Georgia ITS. This segment would cross one blue line stream just west of East Nance Springs Road.

Segment 6 would follow a southeast course for 1.8 miles. It would cross Old Dixie Highway and East Nance Springs Road at narrow openings between houses. This segment would cross 21 acres of wooded land and no streams.

Segment 7 is 1.6 miles long and would follow a parallel southeast course east of Segment 6. It would cross two blue line streams, the Conasauga River, one wetland area, 12.4 acres of wooded land, East Nance Springs Road, and a major railroad.

Segment 8 is a short 0.45-mile connector that would cross through open fields.

Segment 9 would follow a southeast course for 1 mile, would cross the railroad, a small wetland, about 6 acres of wooded land, and the Conasauga River.

Segment 10 would follow a nearly south course for 1.4 miles. This segment, east of the Conasauga, would cross three small wetland areas, 6.2 acres of wooded areas, and SR 136.

Segment 11 would follow a south course for 1.3 miles. It would cross the railroad, a blue line stream with wetland areas along the stream bank, the Conasauga River, and 12 acres of wooded land. This segment would pass west of a well-developed residential area north of SR 136.

Segment 12 would follow a twisting path (mostly to the southeast) for 2.4 miles to avoid a developed residential area north of SR 136. It would cross four blue line streams, one wetland area, Mt. Zion and Freeman Roads, SR 136, and 25 acres of wooded land.

Segment 13 would follow a 1.4-mile southeast direction midway between the Conasauga River and a subdivision located south of SR 136. It would pass north of a large wetland area, cross Sisson Bend Road, and 18 acres of wooded land.

Segment 14 would cross the Conasauga River in a southwest direction then turn south. This short (2,400-foot) segment, totally in cultivated fields, would cross one blue line stream.

Segment 15 is a 4,200-foot extension of Segment 11 that would cross SR 136, a small wetland area, the Conasauga River, and one blue line stream. This is an open cultivated area requiring no tree removal.

Segment 16 is a 2-mile long segment with angles that would be required to traverse a narrow open strip of land between the railroad/US 41 area to the west and a heavily developed residential area to the east. It would cross the Conasauga River, SR 136, two blue line streams, a small wetland area, and a 2.5-acre wooded area.

Segment 17 is a short 2,400-foot section that would cross through an open, cultivated field. This is large farm located between the Conasauga River and Fites Bend Road.

Segment 18 is a one-mile section that would follow a path parallel to the Georgia Power 500-kV transmission line 600 feet to its west through an open cultivated area. It ultimately would turn to the southwest and cross the Conasauga River onto a farm.

Segment 19 is a 1.2-mile section that would cross the same farm as Segment 18 in a southeast direction across a cultivated field.

Segment 20 is a 0.9-mile section that would cross a cultivated field in a south direction just passing west of a small wetland area in the field.

Segment 21 is a 1.3-mile section that would run in a southeast direction and about 500 feet parallel to the north bank of the Oostanaula River. This section, which is mostly open fields, would cross one blue line stream and 2.5 acres of wooded area.

Segment 22 is a 2.5-mile extension of Segment 11. It would turn south, cross the Oostanaula River just east of the railroad bridge, then turn to the southeast and parallel the south bank of the river by about 300 feet (for a distance of about 2.2 miles). This route would cross three wetland areas, two blue line streams, and come very near some circular irrigation systems in a turf farming operation.

Segment 23 is a 1.4-mile section that would parallel the northeast side of the Oostanaula River. It is entirely in an open field. Segment 23 would pass to the west of two rental houses and would cross three small wetland areas.

Segment 24 is a 0.8-mile section that would pass through an open, cultivated field and would be about 500 feet west of and parallel to the Conasauga River.

Segment 25 is a 1.5-mile eastern extension of Segment 24. It would cross the Conasauga River 1.4 miles north of the point where the river merges with the Coosawattee River to form the Oostanaula River. After crossing the river, the segment would turn south and parallel the west side of the Georgia Power 500-kV transmission line for a length of 0.9 miles and cross SR 225. It would then turn south-southwest for a distance of 2,400 feet and cross McDaniel Road.

Segment 26 is a 0.5-mile extension of Segment 24 that would parallel the west side of the Conasauga River in an open, cultivated field.

Segment 27 is a 0.3-mile section that is an extension of Segment 23 across an open field.

Segment 28 is slightly over 1 mile in length. It is an extension of Segments 26 and 27 that would cross the Conasauga River 2,400 feet south of the Segment 25 crossing. This segment would then take a south-southeast path crossing SR 225 and McDaniel Road. It would cross one blue line stream and about 15 acres of wooded land.

Segment 29 is 1 mile in length and would follow a southeast direction and turn southeast and east to stay in the open river bottom farmland north of the Coosawattee River. It would cross 3 acres of wooded area, a narrow wetland area, and two blue line streams. The segment would intersect the path of the Georgia Power 500-kV transmission line, turn south and connect to the northern terminal of the Center Point-Moss Lake right-of-way easement that was purchased in 1995.

2.5.2.5. Establish and Apply Siting Criteria

TVA utilizes a set of evaluation criteria that represent opportunities and constraints for development of transmission line routes. The criteria are oriented toward factors such as existing land use, ownership patterns, environmental features, cultural resources, and visual quality. Cost is also an important factor, with engineering considerations and right-of-way acquisition costs being the most important economic elements.

Information gathered and comments made at the public meeting and during the subsequent comment period were also taken into account. TVA presented two potential corridor alternatives for the new right-of-way at a public meeting in Calhoun, Georgia, on October 7, 2003. At the conclusion of the extended comment period and after making appropriate adjustments to the segments based on knowledge gained during that time, TVA developed fourteen distinct transmission line routes from the twenty-nine alternative segments that could potentially be used (Table 2-1).

Each of the transmission line route options was evaluated according to these criteria relating to engineering, environmental, land use, and cultural concerns. Specific criteria are described below. For each category described, a higher score means a bigger constraint. For example, a greater number of streams crossed, a longer transmission line route length, or a greater number of historic resources affected would give a transmission line route option a worse score.

- *Engineering Criteria*: Total length of the transmission route, length of new right-of-way and rebuilt right-of-way, primary and secondary road crossings, pipeline and transmission line crossings, and total line cost

- *Environmental Criteria*: Slopes greater than 30 percent (steeper slopes mean more potential for erosion and potential water quality impacts), slopes between 20 and 30 percent, visual aesthetics, forested areas, open water crossings, sensitive stream (those supporting endangered or threatened species) crossings, perennial and intermittent stream crossings, wetlands, rare species habitat, natural area crossings, and wildlife management areas

- *Land-Use Criteria*: The number of fragmented property parcels, schools, houses, commercial or industrial buildings, barns, and parkland crossings

- *Cultural Criteria*: Archaeological and historic sites, churches, and cemeteries

Scores for each of the route options were calculated by adding individual criterion values for each potential transmission line route. The resulting sum values were evaluated using standard statistical techniques and were assigned a ranking for each route in each subcategory (engineering, environmental, land use, and cultural).

A weighted score was produced for each transmission line route option in each subcategory. This made it possible to understand which routes would have the lowest and highest impacts on engineering, environmental, land use, and cultural resources. Finally, to determine total impacts, the scores from each category were combined for an overall score.

2.5.2.6. Route Evaluation and Identification

Several of the alternative routes, particularly those that shared segments in the western portions of the study area were less desirable because of the visual impacts a transmission line would have on specific sites associated with the Civil War and Battle of Resaca. Segments 6 and 11 passed within the viewshed of the Chitwood Farm where the actual Battle of Resaca may have occurred according to some scholars. Also, an area near Resaca known as the Fort Wayne Civil War Historic Site adjacent to the Oostanaula River would be crossed by these route segments. The Chitwood Farm is also where the battle reenactment occurs on a regular basis. Many commenters objected that a transmission line on the horizon would negatively affect their historically based efforts and would have a negative impact on tourism in an area that is heavily tied to the Civil War history of the region.

During the comment period TVA also learned that Segment 22 would cross a large tract of land that is used as a turf farming operation and is heavily dependent upon irrigation by its pivot system. A transmission line in this area would have a major impact on that operation. Additionally, access for clearing and construction would be difficult on this segment due to the three wetland areas that the segment would have crossed.

Discussions with other landowners indicated that there was planned residential construction on the vacant areas that would be crossed by Segments 12 and 13.

Upon completion of analysis of all the possible transmission line route segments previously described in Section 2.5.2.4, the route that represented the least impacts and was preferred is Route 13 consisting of Segments 1, 3, 5, 7, 10, 14, 17, 19, 24, 26, 28, and 29.

Based on comments received from property owners, public officials, and resource experts, as well as field surveys and available data sources, the preferred alternative transmission

line route was modified to further minimize overall project impacts (Figure 2-4). TVA's preferred route includes the following adjustments to the segments previously described in Section 2.5.2.4:

Segment 1 of the transmission line route was adjusted to follow the east side of the existing transmission line for a longer distance.

Segment 3 was shifted slightly westward to leave a greater buffer area between private property and the landfill operation.

Segment 7 was rerouted to follow Segment 5 thereby avoiding a large population of a federally listed threatened plant east of East Nance Springs Road and to parallel the railroad through a commercial hunting preserve property.

Segments 10 and 14 were moved slightly to follow field and fence lines at the request of the landowners.

Segments 28 and 29 were adjusted to avoid home construction sites and to minimize impacts to a sod farm crossed by Segment 29.

With these segment adjustments, the new transmission line right-of-way for the preferred route, as surveyed, would begin at the Coosawattee River joining TVA's vacant Center Point-Moss Lake Transmission Line right-of-way. Using 25 descriptive points (Figure 2-4), new right-of-way for the preferred transmission line route would be as follows:

The new easement centerline would be 125 feet west of the Georgia Power Sequoyah-Bowen 500-kV Transmission Line. The route would proceed north from TVA's existing right-of-way for 860 feet across a cultivated field to Point 1 located at the edge of the cultivation.

Here the route would turn to the northwest following the edge of the field for 1,050 feet to the edge of cultivation and turn again to the right crossing a cultivated field for 2,100 feet to another angle point. The route would again turn slightly to the right, and cross the center of a cultivated field for 1,300 feet to Point 2. This section of the route is a modified version of Segment 29 as requested by the landowner. This modification would prevent impacting his planned new home site north of the cultivated fields. This portion of transmission line right-of-way would cross three blue line streams. Also of note, the New Echota National Historic Site is located on the opposite side of the Coosawattee River across from this section of transmission line.

At Point 2, the route would turn north and proceed for 5,000 feet through an undeveloped, wooded area between the Conasauga River and SR 225, ending at Point 3.

Beginning at Point 3, the route would turn to the northwest from a high elevation above the Conasauga River and cross the floodplain to Point 4, located 250 feet west of the riverbank. This section is 1,050 feet in length and corresponds to the north portion of Segment 28.

Point 4 is the beginning of a lengthy crossing of a river bottom, grain-producing farm. This is among the largest farm operations in Gordon County, using the largest equipment and utensils available. The landowner requested that the proposed route follow the edge of the fields with a minimum number of angles and 200 to 300 feet from the top of the riverbank.

Figure 2-4. Adjusted Alternative Route Segments for the Center Point-Moss Lake 230/115-kV Transmission Line in Gordon and Whitfield Counties, Georgia

This section of the proposed route would encompass Points 4 through 9 and would be nearly 3 miles long, occurring entirely in open, cultivated fields that are rotated each year between corn and soybeans. Three streams would be crossed. The route would also cross within portions of the spray area of three pivot irrigation wells and piping. The northern portion of the route would cross the only cultivated area that is above the 100-year floodplain. This portion of the proposed route is similar to the original Segments 17, 19, and 24.

To avoid a small wetland, the route would then turn northward at Point 9 for 1,350 feet and cross a newly dug pond before proceeding slightly northwest for 2,400 feet, crossing the Conasauga River and then following the edge of an open field to Point 10.

From Point 10, the route would turn slightly northwest, pass just east of a small lake, cross SR 136 in an area between existing homes, then down a bluff, across two creeks to a large open pasture ending at Point 11. This section of the proposed route would cross 5.5 wooded acres before the pastureland that is located in the floodplain of the Conasauga River.

From Point 11, the route would turn slightly northeast for a distance of 3,150 feet across an open pasture and hayfield area to Point 12. At Point 12, the route would turn west for 500 feet across the same pasture, cross the Conasauga River entering an undeveloped area west of the river, and proceed 1,800 feet through 6 acres of woods to Point 13.

The proposed route at Point 13 would turn north and follow the west side of the railroad right-of-way. The centerline of the transmission line was surveyed so that no transmission line right-of-way easement would overlap onto the railroad easement. The land west of the railroad is used as a hunting preserve and gun club. The proposed right-of-way distance parallel to the railroad is 4,580 feet, ending at Point 14. The majority of this section is planted in various grain crops to attract wildlife.

At Point 14, the route would turn to the northwest, cross the railroad, pass to the north of a lake and then cross a hayfield before crossing East Nance Springs Road to Point 15. The route section is an adjustment to Segment 7, which was coordinated several times with the landowners to minimize land-use impacts.

Segment 7 was further adjusted beginning at Point 15 to avoid impacting a large area occupied by a federally listed threatened plant. The route would turn north at Point 15 and follow the west side of East Nance Springs Road before turning northwest to Point 16. This section is 1,800 feet long and would result in the purchase of an occupied home that would be on the proposed transmission line right-of-way. The next best alternative considered was across the east side of the road; however, that route would have crossed the primary entrance to the Dow Chemical Plant and would have resulted in two transmission line structures being located in standing water.

At Point 16, the proposed transmission line route would turn west and parallel the existing 115-kV transmission line that serves the NGEMC Tilton Substation. The section between Point 16 and Point 17 is 1,600 feet long and would cross 2 acres of woods. At Point 16, TVA would also tap the 115-kV circuit and extend it eastward for 600 feet to become the new TVA power source for the Tilton Substation.

The route would turn to the northwest at Point 17 and proceed 2,800 feet through a heavily wooded area to Point 18. This portion of the proposed route was coordinated with the environmental group for the landfill operation. At Point 18, the route would turn to the north and proceed 2,200 feet to Point 19. This portion of the proposed route was coordinated with the landowner to maintain a wooded strip on his property to provide a natural buffer between the remainder of his property and the county landfill to his east. This portion of the proposed route would result in the removal of a house on this landowner's property. To avoid a portion of the landfill, the route beginning at Point 19 would turn northwest to Point 20. This short section is 800 feet long and completely wooded.

At Point 20, the route would turn west to cross the area between the residential area to the south and the landfill operation to the north. This completely wooded, 1,550-foot-long section would terminate at Point 21 just east of Old Dixie Highway.

The route would proceed northwest at Point 21 and cross Old Dixie Highway, a 230-kV transmission line, and a 13-kV distribution line. The distance to Point 22 is 3,000 feet through a solid wooded area that is owned by a timber/development company. This portion of the proposed route was influenced by the selection of a suitable point to cross the existing transmission and distribution lines.

Beginning at Point 22, the route would turn north parallel to the east side of the Georgia Power 115-kV Transmission Line. It would continue for 2,600 feet to Point 23. This portion of the proposed route would be located completely on property of a timber company and would be less visible to the public than other proposed alternatives. At Point 23, the route would turn west, cross over the transmission line, then cross Tilton Road in an area between existing homes. The route would turn slightly northwest through an undeveloped wooded area to Point 24. This section is 2,200 feet long and southwest of a residential development.

At Point 24, the route would turn north for 700 feet to Point 25, where it would enter TVA's Center Point Substation property.

2.6. Identification of the Preferred Alternative

Alternative 2 - Construct Moss Lake 230/115-kV Substation and Center Point-Moss Lake 230/115-kV Transmission Line (Action) is TVA's preferred alternative. TVA would construct approximately 15.5 miles of 230/115-kV transmission line along a modified proposed Route 13 (Figure 1-1). The proposed project would affect approximately 306 acres of new right-of-way. In cooperation with USFWS, TVA incorporated plans to ensure that impacts to federally listed species and the federally designated area of critical habitat in the Conasauga River were minimized. TVA also conferred with the Georgia State Historic Preservation Officer (SHPO) to minimize impacts to historic resources in the project vicinity. After selection of the preferred route, affected property owners were mailed information showing the location of the preferred route on their property. Additional comments received from the property owners were reviewed, and where practical, changes were made to the preferred route prior to engineering and environmental field surveys (Section 2.5.2.6). After all parties agreed to the changes, the sections were resurveyed and resulted in the final surveyed route (Figure 1-1).

CHAPTER 3

3. AFFECTED ENVIRONMENT

3.1. Introduction

This chapter describes the existing condition of the environmental resources and factors of the proposed project area that would affect or that would be affected by implementing the proposed action. The affected environment descriptions below are based on field surveys conducted from 2005 through 2006, on published and unpublished reports, and on personal communications with resource experts. This information establishes the baseline conditions against which the decision maker and the public can compare the potential effects of the alternatives under consideration.

3.2. Groundwater

The project area is located in the Ridge and Valley physiographic province and is underlain by Paleozoic-aged rocks of the Ridge and Valley aquifer. This aquifer consists of folded and faulted carbonate, sandstone, and shale. Soluble carbonate rocks and some easily eroded shales underlie the valleys in the province, and more erosion-resistant siltstone, sandstone, and cherty dolomite underlie ridges. The arrangement of the northeast-trending valleys and ridges are the result of a combination of folding, thrust faulting, and erosion. Compressive forces from the southeast have caused these rocks to yield, first by folding and subsequently by repeatedly breaking along a series of thrust faults. The result of the faulting is that geologic formations are repeated several times across the region. Carbonate-rock aquifers in the Chickamauga, the Knox, and the Conasauga groups are repeated throughout the Ridge and Valley physiographic province (Miller 1990).

Groundwater in the Ridge and Valley aquifers primarily is stored in and moves through fractures, bedding planes, and solution openings in the rocks. These aquifers are typically present in valleys and rarely present on the ridges. Most of the carbonate-rock aquifers are directly connected to sources of recharge, such as rivers or lakes, and solution activity has enlarged the original openings in the carbonate rocks. In the carbonate rocks, the fractures and bedding planes have been enlarged by dissolution of part of the rocks caused by the large volumes of acidic groundwater flow. Slightly acidic water dissolves some of the calcite and dolomite that compose the principal aquifers.

Groundwater movement in the Ridge and Valley province is localized, restricted by the repeating physical characteristics of the rock formations that were created by thrust faulting. Older rocks, primarily the Conasauga Group and the Rome Formation, have been displaced upward over the top of younger rocks (the Chickamauga and the Knox groups) along thrust fault planes thus forming a repeating sequence of permeable and less permeable hydrogeologic units. The repeating sequence, coupled with the stream network, divides the area into a series of adjacent, isolated, shallow groundwater-flow systems. The water moves from the ridges where the water levels are high toward lower water levels adjacent to major streams that flow parallel to the long axes of the valleys. Most of the groundwater is discharged directly to local springs or streams (Miller 1990).

A cave with two entrances was located during field surveys within the proposed transmission line right-of-way. Another entrance was found outside of the right-of-way with a spring flowing from the entrance.

Sources of public water supply in both Whitfield and Gordon counties are from both groundwater and surface water (USEPA 2005). Additionally, privately owned well sources could occur in the project area.

The Water Resources Branch of the Environmental Protection Division, Georgia Department of Natural Resources (GDNR) reviewed the proposed substation site and transmission line right-of-way. They found that a small section of a state-designated outer management zone for a source water well for the city of Calhoun falls across the southern portion of the proposed Moss Lake Substation. The groundwater well is located approximately 2.25 miles from the proposed substation. The transmission line right-of-way would not cross any source water protection areas.

In the vicinity of Segments 14 and 15 (Figure 2.4), groundwater in an area south of the Tilton Substation and the nearby manufacturing plant owned by Dow Chemical has been identified by the State of Georgia as being contaminated. The primary contaminant is carbon tetrachloride (Figure 3-1). The area of contamination begins east of the proposed transmission line route on the eastern bank of an unnamed tributary of the Conasauga River and extends back onto the Dow Chemical plant site. There are two plumes of contamination that originate from former source areas. Dow began pump-and-treat activities on site in 1989 and added off-property treatment in 1995.

Two monitoring wells are located west of the unnamed tributary that flows southward past the plant site and into the Conasauga River. Documents on file with the Georgia Environmental Protection Division indicated that groundwater samples collected from these wells in May and September 2006 detected no contamination.

The surface elevation at the proposed location of the transmission line, west of the creek, is 13 to 20 feet above the groundwater elevation at the creek.

The elevation of groundwater appears generally to follow the surface topography, and groundwater is flowing to the river and to the unnamed creek.

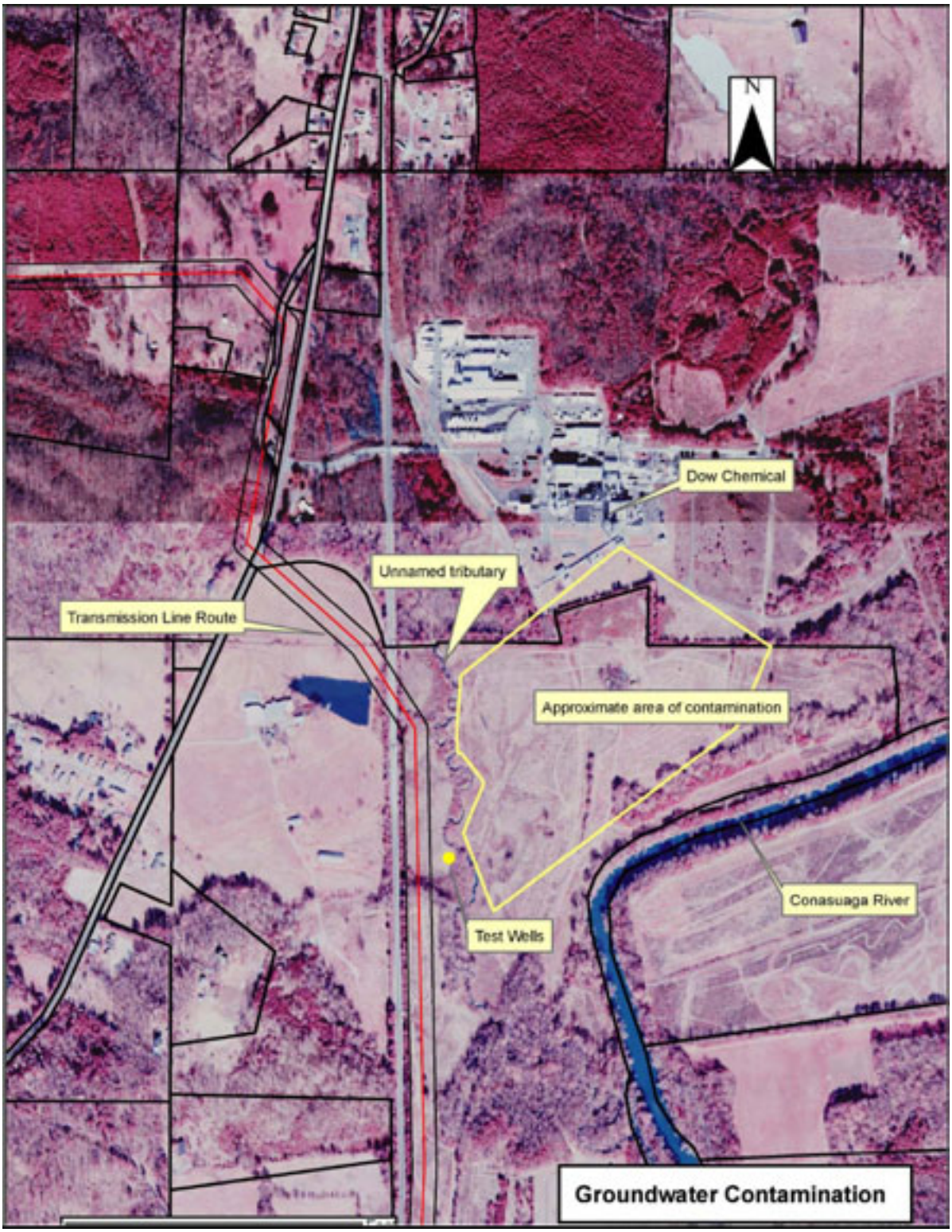

Figure 3-1. Groundwater Contamination Identified by the Georgia Department of Natural Resources in the Vicinity of the Proposed Transmission Line in Whitfield County, Georgia

3.3. Surface Water

Precipitation in the project area averages about 57 inches per year with the wettest month in March at 6.3 inches and the driest month in October at 3.3 inches. The average annual air temperature is 60 degrees °F, ranging from a monthly average of 40°F in January to 79°F in July. Stream flow varies with rainfall and averages about 24 inches of runoff per year or approximately 1.8 cubic feet per second per square mile of drainage area.

The project area drains to the Oostanaula River, the Coosawattee River (and its tributary Crane Eater Creek), and the Conasauga River (and its tributary Swamp Creek) in the Coosa River Basin in northwestern Georgia. The Oostanaula and the Coosawattee rivers in the project vicinity are classified by the GDNR for drinking water. The remaining streams are classified for fishing. The Oostanaula River is on the state 303(d) list as partially impaired (i.e., not fully supporting its designated uses) due to fish consumption guidance as a result of pollution from nonpoint sources/unknown sources. The Coosawattee River is listed as partially impaired due to fecal coliform bacteria from nonpoint sources/unknown sources. The Conasauga River is listed as not supporting its designated uses due to fecal coliform and fish consumption guidance from a municipal facility (e.g., wastewater discharge) and urban runoff/urban effects.

3.4. Aquatic Ecology

Smaller streams in the Ridge and Valley region have moderate to high gradient and are characterized by limestone rubble and bedrock riffles interspersed with silty sand pools. In addition to these habitats, larger rivers in the region have extensive sand and gravel shoal areas. Waters are relatively productive and vegetation, such as water willow (*Justicia*) and river weed (*Podostemum*), is common in shallow areas. While there are a number of caves and springs in the Ridge and Valley region, no true cavefishes are known to occur in the project area. This region has great habitat diversity and supports an array of aquatic fauna rivaled in the southeastern U.S. only by the Highland Rim region in Tennessee (Etnier and Starnes 1993). The study area streams also support several fish and mussels that are federally and/or state-listed as endangered, threatened, or of conservation concern. These species and their habitats are described in Section 3.7.

Field surveys documented 17 perennial streams and 9 intermittent streams crossing the proposed transmission line right-of-way and access roads (Appendix VII). Perennial stream crossings include three crossings of the Conasauga River, and one crossing of the Coosawattee River. Three farm ponds would either be crossed by the proposed transmission line or abut the right-of-way. No perennial stream crossings would be required for transmission line access roads. Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances) are identified on transmission line design drawings, but are not detailed in this assessment.

3.5. Vegetation

The proposed project occurs in the Ridge and Valley Physiographic Province, which is a diverse region composed predominantly of limestone and cherty dolomite. Landforms are mostly rolling valleys and rounded ridges and hills, with many caves and springs. Soils vary in their productivity, and land cover includes oak-hickory and oak-pine forests, pasture, intensive agriculture, and urban and industrial (Griffith et al. 1997).

The vegetative (physiognomic) classes observed in the project area were Evergreen Forest, Deciduous Forest and Herbaceous Vegetation. These vegetative classes are composed of several specific plant communities such as pine plantations, Ridge and Valley Dry-Mesic White Oak-Hickory Forest, Southern Ridge and Valley Calcareous Flatwoods Forest, Southern Ridge and Valley Small Stream Hardwood Forest, and Sycamore–Sugarberry-Green Ash/Northern Spicebush-Possum-Haw/Reflexed Sedge Forest (NatureServe 2006a), and grass/forbs habitat. NatureServe ranks communities based on the threat of loss of the communities throughout their ranges (globally). Of these community types, neither the pine plantations nor the thickets grass/forbs habitat are described by NatureServe (2006a). The total acreage of the proposed transmission line right-of-way and substation consists of approximately 331 acres. Of this, approximately 87 acres are currently forested. The proposed substation site would occupy approximately 25 acres, of which 5-6 acres would be used for the proposed substation. Existing access roads (paved and dirt roads) occupy approximately 10 acres.

Evergreen Forest consisting of predominantly loblolly tree plantations accounted for approximately 4 percent of the proposed project area. Other canopy species include tulip poplar with small pockets of Chinese privet and elderberry in the understory. Common vines found are cat greenbrier and Japanese honeysuckle. Herbaceous species are scattered and are mostly Christmas fern, ebony spleenwort, and pokeweed.

Deciduous Forest, consisting of four distinct community types, makes up approximately 28 percent of the project area. Two of these communities are considered by NatureServe to be at risk, one as G2 (imperiled globally) and one as G3 (globally rare or uncommon).

Ridge and Valley Dry-Mesic White Oak-Hickory Forest community dominates the Deciduous Forest areas consisting of approximately 19 percent. The canopy is dominated by black oak, mockernut hickory, tulip poplar, and white oak, while the subcanopy consists of dogwood, red maple, sourwood, and white ash. The shrub layer includes dogwood and sweetshrub. Common vines include Japanese honeysuckle, muscadine, and Virginia creeper, and the herbaceous cover includes Catesby's wakerobin, Christmas fern, and little brown jugs. Approximately 25 percent of the proposed substation site is comprised of this community.

The Southern Ridge and Valley Calcareous Flatwoods Forest is ranked as a G2 community and accounts for approximately 6 percent, around 17acres, of the Deciduous Forest in the proposed project area. These forests are seasonally inundated by winter rain, and the soils are then subjected to extreme drying and cracking during the summer growing season. This results in a somewhat stunted canopy and a well-developed, diverse herbaceous layer. The canopy is composed primarily of blackgum, cherrybark oak, loblolly pine, red maple, Shumard's oak, sycamore, water oak, and willow oak. The shrub layer includes American hophornbeam, Chinese privet, deciduous holly, and ironwood. Vines include Carolina coralbeads, climbing hemp vine, Japanese honeysuckle, and poison ivy. Herbaceous layer is diverse and composed of, but not limited to, Carolina spiderlily, false nettle, green arrow arum, Indian woodoats, sensitive fern, and smartweed. Approximately 77 acres of this community occurs within 1,000 feet of the proposed transmission line, of which the majority occurs within 0.5 mile of the Conasauga River.

In addition, with the Deciduous Forest, the Southern Ridge and Valley Small Stream Hardwood Forest is ranked as a G3 community and accounts for approximately 2 percent of the proposed project area. The canopy is dominated by beech, loblolly pine, mockernut hickory, red maple, shagbark hickory, southern sugar maple, and white oak, with the shrub

layer less diverse consisting of sweetshrub and immature beech, mockernut hickory, and red maple tree species. The herbaceous layer is more diverse, made up of beechdrops, Christmas fern, little brown jugs, white wood aster, and wild yam. Vines are common and are comprised of Japanese honeysuckle, muscadine, and roundleaf brier.

The last Deciduous Forest community type found in the proposed project area is the Sycamore-Sugarberry-Green Ash/Northern spicebush-Possum-Haw/Reflexed Sedge Forest and occupies approximately 1 percent. The community occurs on terraces of associated rivers and large creeks. The canopy contains flood-tolerating species such as silver maple, southern hackberry, and sweetgum and has a shrub layer dominated by Chinese privet, deciduous holly, and spicebush. The herbaceous layer is made up of butterweed, false nettle, Indian woodoats, and smartweed. The vine layer is composed of poison ivy, roundleaf greenbrier, and trumpet honeysuckle.

Herbaceous Vegetation occupies approximately 68 percent of the proposed project transmission line right-of-way and substation site. This area is dominated by grass/forbs habitats that occur primarily as rights-of-way, managed grass fields, crops, and roadsides. The rights-of-way are mostly comprised of anisescented goldenrod, broomsedge bluestem, Canada goldenrod, dog fennel, downy lobelia, hairy white old-field aster, silver plume grass, southern blackberry, and splitbeard bluesedge. The managed grass fields are dominated by blackberry, broomsedge bluestem, dog fennel, rabbit tobacco, ragweed, and sneezeweed. Crops evident in the area are corn, hay, and soybeans and account for 33 percent of the Herbaceous Vegetation. Roadsides in the project area are covered with Bermuda grass, broomsedge bluestem, Johnson grass, and sericea lespedeza. Approximately 75 percent of the substation site is occupied by herbaceous vegetation in the form of managed grass fields.

With the exception of the G2 and G3 communities, the plant communities observed along the proposed route are common and representative of the region.

Invasive exotic plant species encountered along the proposed route include Chinese privet, Japanese honeysuckle, Johnson grass, kudzu, and sericea lespedeza. All of these species have the potential to impact the native plant communities adversely because of their potential to spread rapidly and displace native vegetation. Invasive plants are most prevalent in the Herbaceous Vegetation community, where the native vegetation has been extensively altered as a result of previous land-use history. All of these invasive species are Rank 1 (severe threat) and are of high priority to TVA (James 2002).

3.6. Wildlife

Wildlife habitats observed in the project area have been moderately impacted by previous agricultural practices and development. Much of the project area consists of early successional habitats dominated by Herbaceous Vegetation, and the remainder is interspersed with several forested habitat types (Section 3.5). The Conasauga and Coosawattee rivers are major aquatic features within the project area landscape.

The early successional habitat (Herbaceous Vegetation) is comprised of both row crops, which offer little habitat for wildlife and a combination of pastures, old fields, and young thickets. Prevalent bird species observed in these latter habitats include American goldfinch, brown thrasher, Carolina wren, common yellowthroat, eastern bluebird, eastern meadowlark, eastern towhee, field sparrow, gray catbird, indigo bunting, mourning dove,

northern bobwhite, and white-throated sparrow. Additional animal species included white-tailed deer, eastern cottontail, and short-tailed shrew.

The deciduous forest component is comprised of both upland (19 percent) and bottomland (9 percent) forest habitats. Within the upland deciduous forest, common bird species observed were American crow, barred owl, blue jay, Carolina chickadee, downy and red-bellied woodpeckers, great-crested flycatcher, northern cardinal, northern flicker, red-eyed vireo, summer and scarlet tanagers, tufted titmouse, white-breasted nuthatch, and wood thrush. Other observed animals included eastern gray squirrel, eastern chipmunk, raccoon, white-footed mouse, white-tailed deer, eastern box turtle, eastern garter snake, green anole, northern fence lizard, rough green snake, and marbled salamander.

The bottomland forest contained bird species such as blue-gray gnatcatcher, common yellowthroat, Swainson's warbler, tufted titmouse, and wood duck. Other animals observed in this habitat were swamp rabbit and white-footed mouse, but shrews, water snakes, and a variety of amphibians could also be expected.

The small evergreen forest component was young and dense, with trees often planted in rows. Pine plantations such as these are monotypic habitats, and offer only low-quality habitat to terrestrial animal species.

Small streams and wetlands occurred in all habitats, and the following amphibian species were found within or near these sources of water: Cope's gray treefrog, northern cricket frog, American and Fowler's toads, southern leopard frog, spring peeper, and upland chorus frog. Spotted salamanders were found in small streams within deciduous forested habitats. Two large rivers, the Conasauga and the Coosawattee, also occur within the project area and provide aquatic habitat for several riverine turtles, such as spiny softshell, map turtles, sliders, and river cooters. Shallow habitat along the margins of these rivers also provides habitat for bullfrogs and other amphibians and reptiles.

Three caves occur within 3 miles of the proposed transmission line or substation. Two are located greater than a mile from the project components. A third cave has two entrances. within the proposed right-of-way and a third entrance just outside the proposed right-of-way. A stream flows from this third entrance. The cave entrances were too small to allow safe access, and it is unknown what, if any, animals may use this cave. Both of the cave entrances occurring within the proposed right-of-way are currently in forested areas. Caves are important ecosystems, and often contain many rare organisms that have adapted to the unique cave ecosystem. Surrounding vegetation plays an important role in both shading and stabilizing the microclimate of the entrance and preventing erosion around and runoff into the cave.

3.7. Threatened and Endangered Species

The watersheds affected by the proposed project lie within the Conasauga River drainage. These watersheds encompass portions of Gordon, Murray, and Whitfield counties, Georgia, and Bradley and Polk counties, Tennessee.

Portions of the Conasauga River that would be crossed by the proposed transmission line are federally designated as critical habitat for two endangered fish species, amber darter and Conasauga logperch. Constituent elements considered for the amber darter include high-quality water, silt-free riffle areas composed of sand, gravel, and cobble, which becomes vegetated primarily with water willow during the summer (USFWS 1985).

Constituent elements considered for the Conasauga logperch include high-quality water, pool areas with flowing water and silt-free riffles with gravel and rubble substrate, and fast riffle areas and deeper chutes with gravel and small rubble (ibid).

Within the Conasauga River drainage in Gordon, Whitfield, and Murray counties, additional segments of the Oostanaula, Coosawattee, and Conasauga rivers, and Holly Creek have been designated as critical habitat for three federally listed as threatened (fine-lined pocketbook, orange-nacre mucket, and Alabama moccasinshell) and eight federally listed as endangered freshwater mussels (Coosa moccasinshell, ovate clubshell, southern clubshell, dark pigtoe, southern pigtoe, triangular kidneyshell, southern acornshell, and upland combshell). Primary constituent elements essential for the conservation of these 11 mussel species include the following (USFWS 2004):

1. Geomorphically stable stream and river channels and banks

2. A flow regime (i.e., the magnitude, frequency, duration, and seasonality of discharge over time) necessary for normal behavior, growth, and survival of all life stages of mussels and their fish hosts in the river environment

3. Water quality, including temperature, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages

4. Sand, gravel, and/or cobble substrates with low to moderate amounts of fine sediment, low amounts of attached filamentous algae, and other physical and chemical characteristics necessary for normal behavior, growth, and viability of all life stages

5. Fish hosts with adequate living, foraging, and spawning areas for them

6. Few or no competitive nonnative species present

No designated critical habitat for terrestrial animals or plants occur within the project area.

The TVA Natural Heritage database and data acquired from the Georgia Natural Heritage Program (GDNR 2006) and USFWS (Appendix I) were used to determine the listed species that could occur in the project area. Thirty-eight federally listed and state-listed aquatic animal species are known to occur within Gordon, Murray, and Whitfield counties, Georgia, and Bradley and Polk counties, Tennessee. Of these, 29 aquatic animal species occur in the Conasauga River drainage (Table 3-1), with the remaining 9 species occurring only in the Tennessee River drainage. Because none of the project area drains to the Tennessee River system, the 8 state-listed species restricted to this system are not discussed further. As for the species occurring within the Conasauga River system, because of the high number of federally and state-listed aquatic animals present in the drainage, the presence of one or more listed species can be assumed at most, if not all, perennial stream crossings

Three federally listed and one state-listed plant species are known within 5 miles of the proposed project (Table 3-1). A botanical field survey conducted along the proposed transmission line route in October 2005 found the federally listed large-flowered skullcap growing within the footprint of the project. Another field survey was conducted in May 2006 on a relocated section of the transmission route, and no federally listed or state-listed plant species were identified during this survey.

No federally listed terrestrial animal species in either Gordon or Whitfield counties. However, two state-listed terrestrial animal species have been recorded within a 3-mile radius of the project area (Table 3-1). Field investigations for this project found no federally or state-listed terrestrial animal species in the proposed project area.

Descriptions for aquatic animal species that could potentially be affected by the proposed project and are federally or Georgia state-listed as either threatened or endangered are provided below. Additionally, descriptions are provided for the federally listed plant species and both state-listed terrestrial animal species that occur within the proposed project area.

Table 3-1. Federally Listed and State-Listed Species Reported From the Proposed Project Area

Common name	Scientific name	Status[1]	
		Federal	State
Crayfish[2]			
Conasauga blue burrower	*Cambarus cymatilis*	--	NOST (S1) - GA
Fish[2]			
Amber darter	*Percina antesella*	END	END (S1) - GA END (S1) - TN
Blue shiner	*Cyprinella caerulea*	THR	END (S1) - GA END (S1) - TN
Bronze darter	*Percina palmaris*	--	NOST (S3) - GA
Bullhead minnow	*Pimephales vigilax*	--	NOST (S3) - GA
Burrhead shiner	*Notropis asperifrons*	--	NOST (S2) - TN
Coldwater darter	*Etheostoma ditrema*	--	THR (S1) - GA THR (S1) - TN
Conasauga logperch	*Percina jenkinsi*	END	END (S1) - GA END (S1) - TN
Flame chub	*Hemitremia flammea*	--	END (S1) - GA NMGT (S3) - TN
Frecklebelly madtom	*Noturus munitus*	--	END (S1) - GA THR (S1) - TN
Freckled darter	*Percina lenticula*	--	END (S1) - GA
Goldline darter[3]	*Percina aurolineata*	THR	THR (S1) - GA
Greenbreast darter	*Etheostoma jordani*	--	NOST (S2S3) - GA
Holiday darter	*Etheostoma brevirostrum*	--	THR (S2) - GA THR (S1) - TN
Lined chub	*Hybopsis lineapunctata*	--	NOST (S2) - GA
Mountain shiner	*Lythrurus lirus*	--	NOST (S3) - GA
Muscadine darter	*Percina sp. 3*	--	RARE (S2) - GA
Riffle minnow	*Phenacobius catostomus*	--	NOST (S3) - GA
River redhorse	*Moxostoma carinatum*	--	RARE (S2) - GA
Trispot darter	*Etheostoma trisella*	--	THR (S1) - GA THR (S1) - TN
Mussels[2]			
Alabama clubshell	*Pleurobema troschelianum*	CAND	NOST (S1) - GA NOST (S1) - TN

Common name	Scientific name	Status[1]	
		Federal	State
Alabama creekmussel	*Strophitus connasaugaensis*	--	NOST (S2S3) - GA NOST (S1) - TN
Alabama moccasinshell	*Medionidus acutissimus*	THR	THR (S1) - GA THR (S1) - TN
Coosa moccasinshell	*Medionidus parvulus*	END	END (S1) - GA END (S1) - TN
Finelined pocketbook	*Lampsilis altilis*	THR	THR (S2) - GA THR (S1S2) - TN
Georgia pigtoe	*Pleurobema hanleyianum*	CAND	NOST (S1) - GA NOST (S1) - TN
Painted clubshell	*Pleurobema chattanoogaense*	CAND	NOST (S1) - GA NOST (S1?) - TN
Southern clubshell	*Pleurobema decisum*	END	END (S1) - GA END (S1) - TN
Southern pigtoe	*Pleurobema georgianum*	END	END (S1) - GA END (S1) - TN
Triangular kidneyshell	*Ptychobranchus greenii*	END	END (S1) - GA END (S1) - TN
Plants[4]			
Georgia rock-cress	*Arabis georgiana*	CAND	THR (S1) - GA
Large-flowered skullcap	*Scutellaria montana*	THR	THR (S2) - GA
Rose-gentian	*Sabatia capitata*	--	RARE(S2) - GA
Yellow-eyed-grass	*Xyris tennesseensis*	END	END (S1) - GA
Reptiles[5]			
Alabama Map Turtle	*Graptemys pulchra*	--	RARE (S1) - GA
Map Turtle	*Graptemys geographica*	--	RARE (S1) - GA

-- = Not applicable
GA = Georgia
TN = Tennessee
[1] Status codes: **CAND** = Candidate for federal listing; **END** = Endangered; **NMGT** = In need of management; **NOST** = No legal status, but tracked by the Tennessee Natural Heritage Program; **RARE** = State listed as rare; **THR** = Threatened; **S1** = Extremely rare and critically imperiled in the state with 5 or fewer occurrences; or very few remaining individuals; or because of some special condition, where the species of some factor(s) make it vulnerable to extinction; **S2** = Very rare and imperiled within the state, 6 to 20 occurrences; **S3** = Rare or uncommon with 21 to 100 occurrences; S? Unranked at this time or rank uncertain
[2] Listed aquatic animals known to occur in the Conasauga River drainage of Gordon, Murray, and Whitfield counties, Georgia, and Bradley and Polk counties, Tennessee, and within 10 miles of the proposed Center Point-Moss Lake 230/115-kV Transmission Line route
[3] Federally listed species occurring within the project area, but in the Coosawattee River drainage.
[4] Listed terrestrial plants reported within 5 miles of the proposed transmission line in Murray, Whitfield, and Gordon counties
[5] Listed terrestrial animals reported from Whitfield and Gordon counties

Fish

Within the project area, the amber darter, Conasauga logperch, freckled darter, and frecklebelly madtom are known only from the Conasauga River proper. The blue shiner and holiday darter are both known from the Conasauga River and some larger tributaries, and the Goldline darter is restricted to the Coosawattee River.

The trispot darter is found in the Conasauga and Coosawattee rivers and their tributaries, but migrates to spring seeps over marsh grass for breeding during January through March.

The coldwater darter and flame chub are both found in springs or spring-influenced areas where aquatic vegetation is abundant. The coldwater darter is endemic to the Coosa River system and is only found in vegetated spring-fed runs and pools. Flame chubs spawning aggregations have been observed in flooded pastures and fields (Etnier and Starnes 1993; Mettee et al. 1996). Springs and small headwater streams are vulnerable to many kinds of local perturbations. Consequently, populations of both species have been eliminated from many areas. Elevated bridge culverts may create barriers to exclude the fish and/or inhibit recruitment (NatureServe 2006b).

Mussels

Although reported from the project area, the upland combshell, southern acornshell, gulf moccasinshell, and ovate clubshell have not recently been found within the area and are considered extant (USFWS 2003). Within the project area, extant populations of the painted clubshell, southern clubshell, southern pigtoe, Georgia pigtoe, and Alabama clubshell are known only from the Conasauga River proper. The fine-lined pocketbook, Coosa moccasinshell, and triangular kidneyshell are known from the main stem Conasauga River and Holly Creek.

The precise habitats of these mussels vary according to depth, current velocity, and substrate types (Parmalee and Bogan 1998). However, they all require relatively well-oxygenated, clean water, and the major threats are from habitat modification, sedimentation, and water quality degradation (NatureServe 2006b).

Plants

Georgia rock-cress is found in shallow soil accumulations on rocky bluffs, ecotones of gently sloping rock outcrops, outcrops along rivers, and sandy loam along eroding riverbanks. It is occasionally found in adjacent mesic woods, but it will not persist in heavily shaded conditions. This species requires high to moderate light conditions, and occurs on soils that are nearly neutral to slightly basic (NatureServe 2006a).

Large-flowered skullcap is typically found in rocky, shallow soils, and on submesic to xeric, well-drained, slightly acidic oak-pine forests in the Ridge and Valley and Cumberland Plateau provinces of northwestern Georgia and adjacent southeastern Tennessee. In Georgia, it has been reported from elevations of 620 to 870 feet on steep, lower slopes of all aspects. In Tennessee, the elevation range of the species is much greater. The soil is always rocky and somewhat shallow, with plants rooted in deeper soil between boulders or on as little as 1 inch of soil over rocks (ibid).

Tennessee yellow-eyed grass is usually found on acidic soils; however, it is restricted to basic or nearly neutral soils that thinly cover calcareous substrates with year-round seepage or mineral-rich water flow. This species is found in open or thin canopy woods in gravelly seep-slopes or gravelly bars and banks of small streams, springs and ditches (ibid).

Reptiles
Map turtles inhabit a variety of large water features such as lakes and rivers, while Alabama map turtles occur specifically in rivers that are large and have a swift current (Ernst et al. 1994). Both species require habitat with abundant basking structures. Suitable habitat within the project area exists for both species in the Conasauga and Coosawattee rivers.

3.8. Wetlands

Wetlands are areas inundated by surface water or groundwater such that vegetation (hydrophytes) adapted to saturated soil conditions are prevalent. Wetland substrates consist predominantly of undrained hydric soil, soils that are saturated with water and usually deprived of oxygen. Wetland examples include palustrine areas (described as lacking flowing water, including marshes and swamps as well as bogs, fens, wet meadows, and floodplains) and lacustrine areas (described as lake-associated, including freshwater marshes, aquatic beds, and lakeshores).

The proposed transmission line right-of-way is located in Gordon and Whitfield counties, Georgia, in four subwatersheds of the Upper Coosa River Basin (hydrologic unit code [HUC] 03150101), a tributary to the Mobile River. Two subwatersheds are in the Conasauga River watershed (HUC 03150101-0501 and -0503), one is in the Coosawattee River watershed (HUC 03150102-0807), and one is in the Oostanaula River watershed (HUC 03150103-0101). No land-use/land-cover data were available for this review; however, approximately 663 acres (0.003 percent) of Whitfield County is catalogued as wetland habitat (North Georgia Regional Development Center 2002). According to GDNR (1995), there are approximately 1,002 acres (0.004 percent) of wetlands in Gordon County. The project area is located in the Ridge and Valley Physiographic Province near the foothills of the Georgia Blue Ridge. This region is characterized by a mosaic of forest, cropland, and residential areas. The proposed transmission line would span 15.5 miles, crossing cropland, natural and channelized streams, and secondary upland and bottomland forests.

Wetland determinations were performed according to the USACE standards that require documentation of hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987; Reed 1997). Broader classification definitions of wetlands, such as that used by the USFWS (Cowardin et al. 1979) and the TVA Environmental Review Procedures definition (TVA 1983), were also considered in this review. Using a TVA-developed modification of the Ohio Rapid Assessment Method (Mack 2001) specific to the TVA region (known as TVARAM), wetlands were categorized by their functions, sensitivity to disturbance, rarity, and irreplaceability. The categorization was used to assess significance, evaluate impacts, and determine the appropriate levels of mitigation for wetland impacts.

For wetlands crossed more than once by a proposed transmission line route or access road, a separate USACE wetland determination form was completed for each crossing. However, for the entire wetland, a single TVARAM form was completed. The TVARAM is designed to distinguish between three categories of wetlands.

Category 1 wetlands are described as “limited quality waters.” They are considered a resource that has been degraded, has limited potential for restoration, or is of such low functionality that lower standards for avoidance, minimization, and mitigation can be applied. Category 2 includes wetlands of moderate quality and also wetlands that are

degraded but exhibit reasonable potential for restoration. Avoidance and minimization are the first lines of mitigation for Category 2 wetlands. Category 3 generally includes wetlands of very high quality and wetlands of concern regionally and/or statewide, such as wetlands that provide habitat for threatened or endangered species.

During field surveys conducted in October 2005 and May and July 2006 to identify all jurisdictional wetlands within the proposed transmission line right-of-way and access roads, 12 separate wetlands were located (Table 3-2).

Wetland W1 is a palustrine emergent and scrub-shrub system located within the floodplain of an unnamed tributary to the Coosawattee River. The wetland area within the right-of-way is dominated by buttonbush, curlytop knotweed, cocklebur, and redtop panic grass.

Wetland W2 is a palustrine forested wetland complex. This wetland exhibits gleyed soils and is associated with an unnamed tributary to the Conasauga River. The wetland is dominated by green ash, black willow, and silver maple.

Wetland W3 is a palustrine forested wetland complex with inundated soils that is connected hydrologically to the Conasauga River on a farmed peninsula surrounded by rivers. This wetland complex would be crossed by an existing well-maintained gravel road (access road #AP-16A); therefore, no grading, clearing, or other maintenance activities or associated impacts to the adjacent wetland area would be necessary. The wetland is dominated by willow oak, Shumard's oak, and swamp chestnut oak.

Table 3-2. Wetlands Located Along the Proposed Project Transmission Line Right-of-Way

Wetland Identification	Wetland Classification[1]	TVARAM Category	Total Acreage	
			Within the Right-of-Way	Forested
W1	PEM1E/PSS1E	3	0.11	0
W2	PFO1E	3	0.24	0.24
W3	PFO1A/PSS1B/PEM1H/ PUBFx/PUBH	3	0 (access road)	0
W4a	PFO1B	2	5.43	1.03
W4b	PFO1B	2		
W4c	PSS1C	2		
W4d	PFO1C-clear-cut	2		
W5	PEM1E/PSS1E	2	0.48	0
W6	PEM1B/PSS1B	2	0.20	0
W7	PEM1B/PSS1B	2	0.07	0
W8	PSS1B	2	0.45	0
W9	PFO1E/PEM1E	3	0.25	0.19
W10	PFO1B/PSS1B/PEM1B	2	0.25	0.09
W11	PFO1B	3	0.14	0.14
W12	PFO1E/PEM1E	2	1.27	0.89
TOTAL			**8.89**	**2.58**

[1] Classification codes as defined in Cowardin et al. 1979: PFO = Palustrine forested; PEM = Palustrine emergent; PSS = Palustrine scrub-shrub; PUB = Pond

Wetlands W4a-d are parts of a very large palustrine wetland complex of forested wetlands with scattered scrub-shrub components. This larger wetland is associated with an unnamed tributary to the Conasauga River. The transmission line right-of-way would cross this complex in four locations with approximately 5.43 acres occurring within the right-of-way. Of this, however, 4.4 acres of the northern portion of this wetland has been recently clear-cut by the landowner. Therefore, only 1.03 acres of forested wetland within the right-of-way would require clearing. The wetland is dominated by green ash, sweetgum, and silver maple.

Wetland W5 is a palustrine scrub-shrub/emergent wetland with saturated soils, associated with an unnamed tributary to the Conasauga River. This wetland includes an intermittent stream channel and is located on an actively managed game preserve. The wetland is dominated by giant cane, green ash, and leathery rush.

Wetland W6 is a palustrine scrub-shrub/emergent wetland with saturated soils, associated with an unnamed tributary to the Conasauga River. This wetland receives drainage from a farm pond on the west side of the railroad tracks and is periodically mowed. The wetland is dominated by sweetgum, Chinese privet, and soft rush.

Wetland W7 is a palustrine scrub-shrub/emergent wetland with saturated soils, associated with an unnamed tributary to the Conasauga River. The wetland is dominated by red maple, sandbar willow, tag alder, and lizard's tail.

Wetland W8 is a palustrine scrub-shrub/emergent wetland with saturated soils, associated with an intermittent stream that is tributary to the Conasauga River. This wetland, dominated by sweetgum, Chinese privet, and willow, is in an old pasture and drains east into a larger, forested wetland complex.

Wetland W9 is a palustrine forested wetland containing patches of emergent vegetation. This wetland exhibits inundated soils and is associated with an unnamed tributary to the Conasauga River. Dominant species within the wetland are sweetgum, red maple, and soft rush.

Wetland W10 is a palustrine forested, scrub-shrub, and emergent wetland complex that formed in association with an old farm pond. The pond dam has since breached and no longer holds water. This wetland is associated with an unnamed tributary to the Conasauga River. The wetland is dominated by black willow, sweetgum, red maple, and green ash.

Wetland W11 is a palustrine forested wetland complex. This wetland exhibits saturated soils and is associated with an unnamed tributary to the Conasauga River. The wetland is dominated by green ash, sycamore, and ironwood.

Wetland W12 is a palustrine forested and emergent wetland complex that has been influenced by recent beaver activity. This wetland exhibits inundated soils and is associated with an unnamed tributary to the Conasauga River. The wetland is dominated by slippery elm, sycamore, and boxelder.

All wetlands described are potentially jurisdictional and regulated by USACE under the Clean Water Act. A jurisdictional determination would be required by USACE to make a conclusive determination of their regulatory status. All wetlands identified within the

proposed project area function in storm water retention, erosion control, toxicant absorption, and flood control and offer wildlife habitat.

3.9. Floodplains

The proposed transmission line would cross the identified floodplain of the Conasauga River in Whitfield and Gordon counties, Georgia, and the Coosawattee River in Gordon County. The existing Center Point and Tilton substations and the proposed Moss Lake Substation sites are located outside of the 100-year floodplain.

3.10. Visual Resources

Visual resources are evaluated based on existing landscape character, distances of available views, sensitivity of viewing points, human perceptions of landscape beauty/sense of place (scenic attractiveness), and the degree of visual unity and wholeness of the natural landscape in the course of human alteration (scenic integrity).

The existing Center Point Substation is located approximately 0.25 mile off US 41, just south of the city of Dalton, Georgia. Vegetation surrounding the substation is dense, and the topography is gently sloping. From this point, the proposed transmission line route would bear south and east through mature vegetation and in the foreground (up to 0.5 mile from the observer) of several existing residences at the Tilton Road crossing point. Existing transmission lines and distribution lines are currently visible along the roadway.

Upon crossing at Tilton Road, the proposed transmission line route would resume a southerly course for over 0.5 mile. Mature vegetation is visible to the east. Poultry operations may be seen to the west in this section of the proposed route where little residential development is apparent. Views would become more confined by vegetation as the proposed route bears east and crosses near the intersection of Old Dixie Highway and George Brock Road.

The proposed transmission line route would continue eastward, where vegetation opens to the north near the periphery of an area landfill. The proposed transmission line route would then bear southward along the boundary of the landfill area and cross within the foreground of three residences along Adams Road before turning slightly eastward where dense mature vegetation prohibits views beyond Adams Road to the south and east. The proposed transmission line route would continue in this manner, and upon intersecting the existing transmission line right-of-way from the Tilton Substation, it would turn to the east and parallel Nance Springs Circle before nearing Nance Springs Road and crossing near the Dow Chemical Plant training facility.

Vegetation patterns change and topography moderates as the proposed route nears the CSX Railroad right-of-way. To the west, views open over expansive fields where several residences are visible across Nance Springs Road. To the east, and through the thin vegetation along the railroad right-of-way, more agricultural fields are visible along the banks of the Conasauga River. Views would remain similar as the proposed transmission line route parallels and then crosses the railway, bearing eastward toward the river.

Upon crossing the Conasauga River, the proposed route would turn to the south across open, agricultural fields that are banded by vegetation along the riverbanks to the west and forestland to the south and east. Views open to the middleground (0.5 mile to 4 miles from

the observer) to the north across the expansive fields. As the proposed transmission line route bears slightly eastward, the vegetation to the southeast becomes denser along a small creek that feeds the river. Slightly upland from the creek to the south, several residences are visible in the foreground, as the proposed transmission line route would reach SR 136. To the south of the roadway, the vegetation is dense, and the topography is gently sloping. The proposed route would then cross the Conasauga River a second time, and the topography and vegetation patterns remain consistent. Agricultural fields are spread about the riverbanks and bandings of mature trees line the periphery.

The proposed transmission line route would then turn to parallel the river where several residences are visible to the southwest along Fite Bend Road. Views are predominated by the agricultural operations occurring along the lowland areas bordering the river. Views are limited to the east, as vegetation thickens along the opposing bank. To the south and west, views remain consistent into the middleground, as the proposed transmission line route would continue alongside the Conasauga River for approximately 2 miles before it would cross for the third time. Vegetation patterns change above the eastern bank of the river, as pine and mixed hardwoods replace the sprawling fields. Continuing southward, the proposed transmission line route would cross SR 225 near a river access point for the Coosawattee River, which merges with the Conasauga River forming the Oostanaula River about 0.25 mile to the east.

Leaving the roadway to the southeast, agricultural fields open to the south and offer views similar to those along the banks of the Conasauga River. Mature vegetation surrounds the large fields and limits views to the foreground viewing distance. The proposed transmission line route would cross a field approaching the Coosawattee River before it would bear to the east and less than 1 mile later intersect with the existing TVA transmission line right-of-way. Along the proposed transmission line route in its entirety, the scenic attractiveness is common, and the scenic integrity is moderate.

3.11. Recreation, Parks, and Managed Areas

The proposed transmission line is within 3 miles of two managed areas and/or ecologically significant sites and two Nationwide Rivers Inventory (NRI) Streams or Wild and Scenic Rivers.

The proposed transmission line would cross approximately 1.5 miles upstream of the Oostanaula River and over the Coosowattee and Conasauga rivers. All three rivers are on the NRI. The section of the Coosawattee that is on NRI is about 20 miles upstream of the project boundaries; however, the sections of the Oostanaula and the Conasauga are within the project boundaries.

The Conasauga River from River Mile (RM) 0 at the confluence with the Oostanaula River to RM 64 at the Tennessee state line is listed on the NRI. The proposed project would cross the NRI section of the river at three locations. The first would occur east of Nance Springs, located on the Whitfield and Gordon County line. The second would be northeast of the town of Resaca and south of SR 136 in Gordon County. The last would occur north of Fork Ferry Bridge, west of SR 225 in Gordon County. The proposed project would run south parallel to the Conasauga River beginning at the second crossing until the confluence of the Oostanaula and Coosawattee rivers. The route would then parallel the Coosawattee River until the transmission line would cross the river and meet an existing transmission line south of SR 225 and north of SR 156.

The most popular sections of the Conasauga River for canoeing and kayaking are in the upper reaches, on the Georgia/Tennessee border near Jacks Creek, where the River can reach Class III or IV in the spring when flows are high (Sehlinger and Otey 1980). The lower section is generally Classes I and II; however, when the valley is reached a few miles above US 441, ”rapids have disappeared and the presence of man becomes prevalent” (ibid). The National Park Service (NPS) recognizes this 64-mile segment of the Conasauga River for its scenic, recreational, geologic, fisheries, wildlife, historical, and cultural values.

The Oostanaula River is listed on the NRI, from RM 4 near Rome, Georgia, to RM 51 at the confluence of the Conasauga and Coosawattee rivers, southwest of the Cherokee Indian Memorial. At this confluence, a boat ramp that provides access to all three rivers is located at Fork Ferry Bridge approximately 0.2 mile west of the proposed project. NPS recognizes this 47-mile segment or the Oostanaula River for its scenic, recreational, historical, and cultural values. .

New Echota State Archaeological Area is located in Gordon County. At this location, the Echota Historical Site and Cherokee Indian Memorial are located about 1,000 feet and 3,000 feet west of the proposed transmission line, respectively. This historical town, established in 1825 by the Cherokee National Legislature, became a new governmental seat and the headquarters for the small, independent Indian nation that once covered present-day northern Georgia, western North Carolina, eastern Tennessee, and northeastern Alabama. This active state historic site is managed to preserve historic resources; it provides educational and recreational programs for the public.

Chattahoochee National Forest is approximately 1 mile from the proposed project. The forest covers 749,689 acres in north Georgia and is managed through six ranger district offices of the U.S. Forest Service. An abundance of wildlife and fish species is found within the boundaries, including trout, deer, turkey, and bear. This forest has 1,770 miles of cold or cool water streams; 430 miles of warm-water streams; 19,000 acres of lakes; 3,900 acres of wetlands. Hunting is allowed in designated areas.

No other developed recreation areas or recreation resources occur in the proposed transmission line corridor. Other informal recreation that occurs in the project area include walking, hunting, off-road vehicle use, and wildlife observation and would occur primarily on privately owned land.

3.12. Cultural Resources

Northwest Georgia has been an area of human occupation for the last 12,000 years. Human occupation of the area is generally described in five broad cultural periods: Paleo-Indian (11,000-8,000 B.C.), Archaic (8000-1600 B.C.), Woodland (1600 B.C.-A.D. 1000), Mississippian (A.D. 1000-1700), and Historic (A.D. 1700 to present). Prehistoric land use and settlement patterns vary during each period, but short- and long-term habitation sites are generally located on floodplains and alluvial terraces along rivers and tributaries. Specialized campsites tend to be located on older alluvial terraces and in the uplands.

European interactions with Native Americans in this area associated with the fur trading industry began in the 17th and 18th centuries. European-American settlement increased in the early-19th century as the Cherokee were forced to give up their land. Gordon County was created in 1850 from parts of Floyd and Cass counties, and Whitfield County was created in 1851 from an eastern portion of Walker County. Farming proved to be the main

source of income for both counties despite the rugged terrain. Construction of the Western & Atlantic Railroad began in 1838 to connect the Tennessee and Ohio River Valleys to the interior of the state (Wild 2006). Today, farming is no longer a major part of the economy (Bachtel and Boatright 1993).

TVA identified the archaeological area of potential effect (APE) for the undertaking to be approximately 15.5 miles of proposed transmission line right-of-way, the proposed 25-acre substation property, 22 potential access roads connected to the proposed right-of-way (approximately 15.6 miles), four additional access roads associated with the existing right-of-way (approximately 1.6 miles), and three transmission line reroutes (approximately 1.9 miles). The total area of archaeological investigation for the project was 34.6 square miles. The APE for architectural studies included a 0.5-mile area surrounding the transmission line corridor for a total survey area of approximately 34.6 square miles.

A Phase I historic structure reconnaissance survey was conducted in October 2005. The purpose of the work was to determine whether historic structures were present within the APE of the proposed transmission line route, to evaluate the National Register of Historic Places (NRHP) eligibility of any historic structures in the APE, and to assess the possible effects of the proposed project on any historic structures recommended eligible for the NRHP. Information on materials, construction, condition, and setting was collected.

Prior to the historic/architectural survey, a Georgia Historic Preservation Division literature search identified 31 historic structures previously known from within 0.5 mile of the proposed project corridor. Twelve of these did not contain full survey information, six were determined to be outside the APE, six had been demolished, and two structures (GO-304 and WD-693) were recommended ineligible due to lack of integrity. Although the remaining five structures (GO-201, GO-202, WD-716, WD-717, and WD-718) are recommended eligible for the NRHP, the viewshed (direct line of site between a historic resource and the project work area) has been compromised due to mature tree growth and/or the position or distance of the resources from the proposed transmission line right-of-way.

Two additional historic properties were identified, the Old Dixie Highway and the Western & Atlantic Railroad tracks. One NRHP-listed historic property, New Echota Historic Site, was also identified. New Echota is a Cherokee traditional cultural property and a National Historic Landmark. The historic site is part of the New Echota State Archaeological Area described in the Section 3.11.

During the historic/architectural field surveys, 23 historic structures, a section of Old Dixie Highway, and New Echota were observed. Eleven structures including 3 in Whitfield County (WD716-WD718), 7 in Gordon County (HS-6, GO-201, GO-202, HS-11, HS-12, HS-16, and HS-17),, and the former Western & Atlantic Railroad (HS-14) that is located in both counties, are recommended eligible for listing on the NRHP. The remaining 12 structures are considered ineligible for listing on the NRHP.

Background research was conducted prior to the archaeological survey and identified 31 previously recorded archaeological sites within a 1-mile radius of the project corridor; however, none of these sites lay directly within the proposed transmission line right-of-way or on the proposed substation site.

The archaeological surveys conducted in September and October 2005 identified 27 sites. Four sites (9GO263, 9GO265, 9GO266, and 9GO269) were recommended ineligible for

listing on the NRHP. The NRHP status of 22 archaeological sites is unknown, because these sites were not investigated beyond the project boundaries. The remaining site, 9WD149, is an abandoned section of the historic Western & Atlantic Railroad bed that was used in the Civil War and is recommended potentially eligible for listing on the NRHP.

Page intentionally blank

CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

Chapter 4: Environmental Consequences and Chapter 3: Affected Environment form the detailed scientific and analytic basis for the summary comparisons presented in Chapter 2, Section 2.2 Description of Alternatives.

Section 2.2 contains by alternative the predicted attainment and nonattainment of the purpose and need defined in Chapter 1. Chapter 4 presents the detailed predicted effects of implementing Alternative 1 - Do Not Build Additional Transmission Facilities (No Action) and Alternative 2 - Construct Moss Lake 230/115-kV Substation and Center Point-Moss Lake 230/115-kV Transmission Line (Action).

4.1.1. Alternative 1 - Do Not Build Additional Transmission Facilities (No Action)

Under this alternative, TVA would not construct and operate the proposed transmission line, or take other actions to improve the power supply situation in the NGEMC project area. None of the impacts resulting from the construction and operation of the proposed facilities described below would occur as a result of TVA's actions. In general, however, factors outside of TVA's control would continue to influence natural and cultural resources in the project area.

Additionally, the implementation of Alternative 1, as discussed in Section 2.2.1, would not address the reliability or capacity concerns in the NGEMC service area. As a result, the potential for impacts resulting from the actions that NGEMC could take to address these concerns is considered equal or greater to Alternative 2. Therefore, the effects of implementing Alternative 1 are the same as the effects of Alternative 2 - Construct Moss Lake 230/115-kV Substation and Center Point-Moss Lake 230/115-kV Transmission Line (Action).

4.1.2. Alternative 2 - Construct Moss Lake 230/115-kV Substation and Center Point-Moss Lake 230/115-kV Transmission Line (Action)

Under this alternative, TVA would implement the proposed project. The predicted effects of the construction, operation, and maintenance of the proposed substation and 15.5-mile transmission line are described in this chapter.

4.2. Groundwater

Potential project-related impacts to groundwater could result if sediments from excavated materials enter or clog sinkholes and from the transport of contaminants such as herbicides and fertilizers into sinkholes by storm water runoff. Best management practices (BMPs) as described in Muncy (1999) would be used to avoid contamination of groundwater during construction and maintenance in the project area. BMPs would be used during construction activities to control sediment infiltration from storm water runoff.

During revegetation and maintenance activities, fertilizers and herbicides would not be applied in areas that flow to groundwater infiltration zones (i.e., springs, wells, and sinkholes). Additionally, herbicides with groundwater contamination warnings would not be used in the areas surrounding the cave entrances located within the proposed transmission line right-of-way.

Approximately 500 feet of the southern portion of the proposed Moss Lake Substation site is located within a state-designated outer management zone for a source water well. The substation would have spill containment within the substation site, and all storm water would be captured by an oil and water separator before flowing from the site. Herbicides would not be applied within the area that drains the south side of the proposed substation to avoid impacts to the groundwater recharge area. With these precautions and the use of BMPs, impacts to groundwater from the proposed action would be insignificant.

The transmission line construction would require the installation of three support structures in the vicinity of the identified groundwater contamination south of the Tilton Substation. Two holes would be augured for each structure with a maximum boring depth of 13 feet. Groundwater contamination potentially could be a concern; however, as discussed in Section 3.2, the elevation of groundwater appears generally to follow the surface topography, groundwater is flowing to the river and to the unnamed creek, and the surface elevation at the proposed location of the transmission line, west of the creek, is 13 to 20 feet above the groundwater elevation at the creek. In addition, groundwater samples collected west of the intervening creek show no evidence of contamination. Therefore, the excavation as proposed would not result in any impact on the existing groundwater contamination.

4.3. Surface Water

Soil disturbances associated with access roads or other construction activities can potentially result in adverse water quality impacts. Stream bank erosion and sedimentation can clog small streams, increase nutrient inflows, and threaten aquatic life. Removal of the tree canopy along stream crossings can increase water temperatures, algal growth, dissolved oxygen depletion, and adverse impacts to aquatic biota. Improper use of herbicides to control vegetation could result in runoff to streams and subsequent aquatic impacts.

However, TVA routinely includes precautions in the design, construction, and maintenance of its transmission line and substation projects to minimize these potential impacts. Permanent stream crossings would be designed not to impede runoff patterns and the natural movement of aquatic fauna. Temporary stream crossings and other construction and maintenance activities would comply with appropriate state permit requirements and TVA requirements as described in Muncy (1999). Canopies in all SMZs would be left undisturbed unless there were no practicable alternative. Right-of-way maintenance would employ manual and low-impact methods wherever possible. In areas requiring chemical treatment, only USEPA-registered herbicides would be used in accordance with label directions designed in part to restrict applications in the vicinity of receiving waters and to prevent unacceptable aquatic impacts. Proper implementation of these controls is expected to result in only minor temporary impacts to surface waters. No cumulative impacts are anticipated.

4.4. Aquatic Ecology

Aquatic life could be affected by the proposed action either directly by the alteration of habitat conditions within streams or indirectly due to modification of the riparian zone and storm water runoff resulting from construction and maintenance activities along the transmission line corridor or on the substation site. Potential impacts due to removal of streamside vegetation within the riparian zone include increased erosion and siltation, loss of instream habitat, and increased stream temperatures. Other potential construction and maintenance impacts include alteration of stream banks and stream bottoms by heavy equipment and runoff of herbicides into streams.

The proposed action may cause a temporary increase in sedimentation that could have an effect on aquatic animal species that are adapted to riverine environments. Turbidity caused by suspended sediment can negatively impact the spawning and feeding success of many fish species (Sutherland et al. 2002). The accumulation of sediment across multiple tributaries to the Conasauga River could cumulatively contribute to impacts affecting sensitive aquatic animals and their habitats in this watershed.

The proposed transmission line right-of-way would cross 26 intermittent and perennial watercourses and three ponds in the Conasauga River drainage. To minimize impacts to the aquatic resources along the right-of-way, standard BMPs as identified in Muncy (1999) would be applied during transmission line construction and maintenance. SMZs would be established at all intermittent and perennial stream crossings as identified in Muncy (1999).

Along the proposed transmission line right-of-way and substation site, Standard Stream Protection (Category A) would apply to intermittent streams, and Protection of Important Permanent Streams (Category B) would apply to perennial streams (Appendices IV and VI). These SMZ designations offer more stringent protection than would be normally applied at TVA transmission line stream crossings. However, because the known or likely presence of several federally listed aquatic animals in the affected streams within the proposed project area and because portions of the Conasauga, Coosawattee, and Oostanaula rivers have been designated as critical habitat for several endangered fish and mussel species, increased protective measures at all of these proposed crossings is warranted. Further information regarding sensitive aquatic species is provided in Section 4.7.

Watercourses that convey only surface water during storm events (i.e., wet-weather conveyances) and that could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed in part to minimize disturbance of riparian areas, and subsequent erosion and sedimentation in streams. Wet-weather conveyances are included on transmission line design drawings, and protection of these areas is addressed through the storm water permitting process.

With proper implementation of the appropriate stream protection requirements and the use of standard BMPs as outlined in Muncy (1999), all potential direct, indirect, or cumulative impacts to aquatic communities or habitat as a result of the construction, operation, and maintenance of the proposed transmission line and substation would be insignificant.

4.5. Vegetation

The substation site would affect vegetation types that are common and representative of the region; therefore, no significant impacts to these common communities are expected.

The transmission line route would affect vegetation types that are mostly common and representative of the region; therefore, no significant impacts to these common communities are expected. Also identified during the field surveys of the proposed project area were two rare plant communities: the Southern Ridge and Valley Calcareous Flatwoods Forest (G2) and the Southern Ridge and Valley Small Stream Hardwood Forest (G3).

The Southern Ridge and Valley Calcareous Flatwoods Forest occurred on approximately 17 acres within the project area. Approximately 20 percent of this community type found within 1,000 feet of the proposed project would be cleared. Examples of this community found within the project area are of low quality due to the presence of large populations of invasive species such as Chinese privet, Japanese honeysuckle, and moneywort. Due to the low quality of habitat, impacts are expected to be insignificant to this community type.

The Southern Ridge and Valley Small Stream Hardwood Forest occurred on approximately 6 acres within the project area. Approximately 20 percent of this community type found within 1,000 feet of the proposed project would be cleared. Since a small percentage of this community would be cleared and examples of this community exist in other locations, impacts to this community type as a result of the proposed project are expected to be insignificant.

Approximately 87 acres of forested areas would be cleared for the new right-of-way and 1 acre would be cleared for the access roads. Impacts to the plant communities in the region are expected to be insignificant as a result of the proposed transmission line project.

Since 68 percent of the proposed project occurs on lands with previous and current levels of disturbance to the native plant communities in the forms of managed fields, clear-cuts, herbicide spraying, rights-of-way, and roadsides, no significant spread of invasive species are expected to these areas as a result of the proposed project.

Thirty-two percent of the project occurs within forested areas that have no to large size populations of invasive species. The proposed project area would further fragment the present forest communities into smaller entities. Forest fragmentation has been closely associated with increased susceptibility to infestation by invasive species (Rejmanek 1989). To minimize impacts to these communities, species that are noninvasive would be planted to limit the introduction and spread of invasive species in the transmission line right-of-way. Species that would be planted in these currently forested areas would consist of foxtail millet, Korean lespedeza, and orchard grass (Muncy 1999). The resulting spread of invasive species to the forested areas as a result of the proposed project is expected to be insignificant.

4.6. Wildlife

Terrestrial animal species observed in the project area are considered both locally and regionally common. Temporary fluctuations in local populations of these species are anticipated during the construction activities.

The development of the new transmission line and substation would increase both the proportion of early successional habitats and fragmentation of some forested areas. Some species prefer edge habitat and would likely benefit from the creation and maintenance of the new right-of-way. Other species that are forest dependent and have relatively small

home ranges, or that require specific structural habitat characteristics, could be negatively affected by these habitat changes. Because the proposed transmission line right-of-way intersects a landscape already consisting of a matrix of disturbed, early successional, and forested habitats, further fragmentation of these habitats would not be significant. Nearby areas of both early successional and forested habitats would provide suitable, alternative habitat for mobile species. Overall, impacts to terrestrial animal populations would be minimal since existing habitats along the proposed route are already largely fragmented and heavily impacted by agricultural practices and development. BMPs and SMZs would reduce impacts to wildlife using aquatic features within the project area.

Some migratory songbirds preferring large forested habitats may be displaced from some of the forested areas, although impacts to migratory bird populations would not be significant. No heronries, or other aggregation of migratory birds, are known from within a 3-mile radius of the project area, and no adverse impacts to migratory bird populations are expected. Three caves occur with 3 miles of the project area. Two are located greater than a mile from the project area and would not be affected by the proposed project. A third cave has two entrances directly within the proposed right-of-way and a third just outside of the proposed right-of-way. Surrounding vegetation plays an important role in both shading and stabilizing the microclimate of the entrance and in preventing erosion around and runoff into the cave. Eliminating this vegetation can be detrimental, as cave ecosystems are very sensitive to changes.

Human disturbance also negatively affects caves when the fragile ecosystem is physically disturbed or when pollutants are introduced. One entrance is filled almost completely with fallen rock, but the other two show evidence of human disturbance. Decreasing the surrounding vegetation would not only increase ground erosion and potential runoff but also further expose the cave to increased human disturbance. The latter also presents a safety concern for anyone attempting to enter the caves.

For these reasons, a 200-foot buffer around each cave entrance would be established, and the current vegetation would be maintained to the highest height appropriate for this transmission line. Vegetation would be hand cleared only, and vehicles and equipment would be restricted unless confined to an existing access road. The vegetation buffer would be maintained during future right-of-way maintenance activities. Overall, with this commitment, the proposed construction and maintenance activities would not cause any significant erosion or runoff into the cave entrances, any destabilization of the surrounding rock, or disturbance of vegetation immediately around the cave entrance.

No other unique or important terrestrial animal habitats were identified during field investigation, and with the cave commitment in place, no adverse impacts to these habitats are expected from project-related activities. The Action Alternative would not result in significant direct, indirect, or cumulative adverse impacts to terrestrial animals or their habitats, including aquatic habitats and caves located in the project area.

4.7. Threatened and Endangered Species

The known distribution of endangered and threatened species was considered during the planning and design of this transmission line, and several route segments were relocated to avoid or reduce impacts to listed plants, aquatic animals, and critical habitat. However, because of the significant number of sensitive aquatic animals in the Conasauga River drainage, there is still potential to affect listed aquatic species and critical habitat. The

majority of these species occur primarily in the main stem Conasauga River and its larger tributaries.

Without stream bank protection, soil-disturbing activities and vegetation removal adjacent to tributaries of the Conasauga River as a result of the proposed project could contribute to the siltation and nutrient enrichment already present within this watercourse, resulting in direct and cumulative impacts on nearby aquatic animal populations.

The amber darter, blue shiner, and Conasauga logperch, all federally listed and found in the Conasauga River, are threatened by sedimentation and nutrients. Impacts that could occur as a result of this project include sedimentation to tributaries of the Conasauga River due to runoff from soil-disturbing activities during construction that could inhibit their ability to feed and to spawn. However, with the implementation of the protection measures listed below, no impacts to these species' ability to feed or spawn are anticipated.

Alabama clubshell, Alabama moccasinshell, coosa moccasinshell, fine-lined pocketbook, Georgia pigtoe, painted clubshell, triangular kidneyshell, southern pigtoe, and southern clubshell could also potentially be affected. These species are threatened by sedimentation created from erosion and other soil-disturbing activities such as riparian vegetation removal. Right-of-way construction and maintenance activities have the potential to increase sedimentation in streams crossed by the proposed transmission line. Mussels can be affected by loss of habitat or smothered by high silt loads.

A population of the federally listed large-flowered skullcap was found near the proposed transmission line right-of-way; however, this population would not be affected by the proposed project. No federally listed or state-listed plant species were encountered within the proposed transmission line route; therefore, no impacts to federally listed or state-listed plant species are anticipated as a result of the proposed action.

Suitable habitat for both the state-listed map turtle and Alabama map turtle exists within the Conasauga and Coosawattee rivers. The proposed project would have no direct impacts on the Conasauga or Coosawattee rivers' habitats for these species because of the establishment and maintenance of appropriate SMZs. As discussed in Section 4.4, some indirect or cumulative impacts are possible, but these impacts would be insignificant. Therefore, the river habitat utilized by both the state-listed map turtle and Alabama map turtle would not be adversely impacted, and no direct, indirect, or cumulative impacts are expected for either turtle species. No federally listed terrestrial animals, or designated critical habitat for federally listed terrestrial animal species, are known from Gordon, Murray, or Whitfield counties, and the adoption of the Action Alternative would have no effect on any federally listed or state-listed terrestrial animal species.

Because the Conasauga River is a designated critical habitat for several aquatic animal species, and due to the number of federally listed fish and mussel species that occur in the drainage, the USFWS has requested that all perennial tributaries to the Conasauga River receive a 200-foot SMZ (100 feet on each bank; Appendix I). With the proper implementation of BMPs and the appropriate stream-protection requirements, the primary constituent elements identified for these critical habitat areas would not be significantly affected by construction, maintenance, and operation of the proposed transmission line.

To minimize any direct, indirect, or cumulative effects to listed aquatic species and critical habitat, all construction and maintenance work would be conducted following the

requirements and recommendations presented in Muncy 1999. In addition the following commitments are recommended:

- Category B protections would apply in the Conasauga drainage to perennial streams crossed by the proposed transmission line. As defined in Muncy (1999), a minimum 200-foot SMZ would be established with a 100-foot riparian buffer on each side of the stream (Appendix VII). Construction of temporary stream crossings in these areas is prohibited. The buffer, when possible, would be retained in or planted to native vegetation of at least shrub size.

- Category A protection would apply in the Conasauga drainage to intermittent streams. A 50-foot SMZ would be implemented on both sides of these crossings. Some vegetation within these buffer zones may be temporarily disturbed if culverts, fords, or other temporary stream crossings are necessary, but stream banks would be restored to normal contours and stabilized after removal of the temporary crossing. The buffer, when possible, would be retained in or planted to native vegetation of at least shrub size.

- Fallen or cut trees would be left in place, when possible, in the buffer zone. Trees that must be cleared would be removed with a minimum of ground disturbance (e.g., winched using heavy equipment operating outside the buffer), and root systems would be retained in the ground.

- The transmission line right-of-way would be maintained on a minimum three-year schedule.

- All staging areas and equipment maintenance areas would be located at least 200 feet from stream habitats.

Short-term direct, indirect, or cumulative impacts to federally listed and state-listed aquatic animal species in the proposed project area could result due to runoff from soil-disturbing activities during construction or from subsequent maintenance activities. However, ground disturbance would be minimized during construction, and all construction and maintenance activities would be conducted according to BMPs as outlined in Muncy (1999). With proper implementation of these practices and adherence to the commitments when constructing and maintaining this transmission line, impacts as a result of the proposed project are anticipated to be insignificant.

TVA has concluded that the proposed actions, with the implementation of the environmental commitments and mitigation measures described above and in Section 4.17, would not adversely affect any federally listed or state-listed species or designated critical habitat. In compliance with Section 7 of the Endangered Species Act, TVA consulted with the USFWS over the potential effects on aquatic species and the federally designated critical habitat. In a letter dated June 15, 2007 (Appendix I), the USFWS concurred with TVA's determination that the proposed actions would not adversely affect any federally listed species or critical habitat.

4.8. Wetlands

Activities in wetlands are regulated under Sections 401 and 404 of the Clean Water Act and EO 11990. Section 401 requires water quality certification by the state for projects permitted by the federal government (Strand 1997). Section 404 implementation requires activities in wetlands be authorized through a Nationwide General Permit or Individual Permit issued by the USACE. EO 11990 requires federal agencies to minimize wetland destruction, loss, or degradation, and preserve and enhance natural and beneficial wetland values, while carrying out agency responsibilities. TVARAM can aid in guiding wetland mitigation decisions consistent with TVA's independent responsibilities under the National Environmental Policy Act (NEPA) and EO 11990. Using TVARAM, lower standards for avoidance, minimization, and mitigation can be applied to Category 1 wetlands. Avoidance and minimization should be the first lines of mitigation for Category 2 wetlands. Disturbance of any kind to Category 3 wetlands and their buffer zone should be avoided if at all possible.

Six forested wetlands identified along the proposed right-of-way (W2, W4, W9, W10, W11, and W12) are parts of larger forested wetland complexes that extend outside the proposed right-of-way. The forested wetland areas within the proposed transmission line right-of-way would be cleared and converted to emergent wetland habitat in the short term. These wetlands may remain as emergent wetlands or develop later into scrub-shrub habitat. Five of the 12 wetlands contain scrub-shrub habitat that would also be temporarily converted to emergent habitat, but could develop back to scrub-shrub habitat. Within the wetlands, clearing of the proposed transmission line right-of-way during construction and maintenance would be completed by nonmechanical means, and/or by the use of a feller-buncher located outside of the wetland. The emergent wetland areas would likely require little or no additional clearing or grading. The construction of the proposed transmission line would likely require some structures to be placed within an identified wetland boundary. Appropriate BMPs would be implemented in each of the 12 wetland boundaries to minimize wetland impacts. These BMPs should also minimize or eliminate any effects to wetlands whose boundaries extend beyond the proposed right-of-way.

Of the 2.58 acres of proposed forested wetland that would be converted, 0.57 acre of TVARAM Category 3 wetlands would be affected. Category 3 wetland areas were avoided to the extent practicable during the transmission line siting process, resulting in the roughly half acre of currently proposed Category 3 wetland impacts. All other proposed wetland impacts are associated with Category 2 wetlands, where avoidance and minimization measures resulted in lessening the proposed impacts to 2.01 acres of Category 2 wetlands. TVA would provide compensatory mitigation in the form of wetland credits for project-related impacts to the total 2.58 forested acres of wetland area that would be affected by the proposed transmission line construction and maintenance. TVA has reviewed the USACE Savannah Regulatory District's wetland mitigation guidelines jointly with the TVARAM assessment for ecological significance of all of the affected wetland areas. TVA has determined that the mitigation requirements by the Savannah District would compensate appropriately for the proposed 2.58-acre conversion of Category 2 and Category 3 forested wetlands.

A standard operating procedure for determining compensatory mitigation to wetlands, open waters, and streams is used by the USACE Savannah Regulatory District (USACE 2004). According to this protocol, adverse impacts are scaled based on the dominant effect to wetlands, duration of effects, existing condition of each affected wetland, types of wetlands affected (lost kind), preventability of the action, and rarity ranking of the affected wetlands.

To compensate for the adverse impacts to wetlands affected by construction of the Center Point-Moss Lake Transmission Line, TVA would purchase the necessary mitigation credits as required by the USACE Savannah Regulatory District.

Several mitigation banks are located in the service area affected by the Center Point-Moss Lake Transmission Line project in which credits could be purchased. However, only one bank, the Oostanaula River Bank in Floyd County, Georgia, currently has sufficient mitigation credits available. Purchase of credits specific to Section 404 permit requirements from a qualifying bank as determined by USACE would offset any adverse impacts to forested wetlands in the proposed right-of-way, thus overall impacts to wetlands directly associated with this project would be insignificant.

Additional limited, minor impacts to wetlands may occur as a result of TVA right-of-way maintenance activities. Future TVA right-of-way maintenance activities would follow guidelines described in Section 2.4.2.2 and Appendix VI to avoid or minimize impacts to wetlands. These guidelines include the avoidance of entry by mechanized equipment during vegetation management when the ground is saturated and aerial application of herbicides on scrub-shrub wetlands, as this practice unnecessarily kills low-growing shrubs, vines, and herbaceous species.

The conversion of 2.58 acres of forested wetland habitat and 0.75 acre of scrub-shrub habitat in the proposed Center Point-Moss Lake Transmission Line right-of-way would not significantly impact or diminish the wetland area currently comprising the Upper Coosa River Basin/watershed in Gordon and Whitfield counties, Georgia. Thus, cumulative wetland impacts associated with this project are expected to be insignificant.

4.9. Floodplains

The proposed transmission line crosses several floodplain areas in Whitfield and Gordon counties, Georgia. Consistent with EO 11988, an overhead transmission line and related support structures are considered repetitive actions in the 100-year floodplain. The construction of the support structures for the transmission line would not be expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow-carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-way would be revegetated where natural vegetation is removed, and the removal of unique vegetation would be avoided. BMPs would be used during construction activities.

Based on the access road aerial photos, some of the roads would cross streams or involve construction in the 100-year floodplain. Any necessary improvements to the roads would be done in such a manner that upstream flood elevations would not be increased. The existing Center Point and Tilton substations and proposed Moss Lake Substation would be located outside the 100-year floodplain.

4.10. Visual Resources

Consequences of the impacts to visual resources are examined based on changes between the existing landscape and the landscape character after alteration, identifying changes in the landscape character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The impacts to visual resources are described in

the same manner as the existing visual resources, from north to south along the proposed transmission line route.

Potential viewer groups of the proposed transmission line route and substation would include residents who live within the foreground viewing distance, motorists who travel roadways that cross or come within 0.5 mile of the proposed transmission line, recreational river users on the Coosawattee and Conasauga rivers, and visitors to the landfill located off of Old Dixie Highway.

From the existing Center Point Substation, views of the proposed transmission line would be restricted to the immediate foreground viewing distance, and the new steel-pole transmission structures would be similar to the structures and facilities presently visible at the substation. Views would otherwise be restricted to within the 150-foot-wide right-of-way, as mature vegetation would restrict views from the south, east, and west. Views would open as the transmission line turns to the east, and several residents within the vicinity of the Tilton Road crossing would have foreground views of the transmission line to the south against a background of mature vegetation. These views would be similar in context to views of the distribution lines that are currently visible along the roadway. Motorists traveling the roadway would have brief views of the transmission line from between structures and in context with the existing distribution lines that parallel the roadway.

Upon crossing Tilton Road, the number and duration of views would generally be low, as mature vegetation would prevent views from the west, and poultry operations lie immediately to the east. Within this section of the proposed transmission line right-of-way, views would be limited to private landowners and those employees of the poultry farms to the west. The transmission line would not be readily visible to motorists traveling George Brock Road due to changes in elevation and the dense vegetation that lines the roadway. Near the intersection with Old Dixie Highway, motorists in the vicinity would have views of the transmission line as it nears and crosses the secondary roadway; however, these views would be brief and in context with existing distribution lines that are in the vicinity. Residents immediately to the north along Old Dixie Highway would have intermittent views of the transmission line and associated structures through light vegetation. The duration of available views would change with seasonal variations in foliage. These views of steel-pole structures and the transmission line would be similar in context to the existing distribution lines and structures that are currently visible.

Views of the transmission line nearing the landfill area would be available in the foreground, primarily to those employees and visitors to the landfill. As the proposed transmission line resumes a southerly course and nears residences along Adams Road, foreground views would be available from several residences scattered along the roadway. The steel-pole structures and transmission line would remain similar in context with the existing wooden-pole structures and distribution line that is currently visible from positions along the roadway. Views of the transmission line south of Adams Road would be primarily from the length of the line, as mature vegetation to the east and west prohibit views. Views would open again to residents in the vicinity of Nance Springs Court as the transmission line intersects the existing transmission line from the Tilton Substation. These views available to residents and motorists would be similar in context to those views of existing transmission line structures and facilities. Motorists traveling Nance Springs Road near the entrance to Dow Chemical Plant would have brief views of the transmission line from between structures.

Views of the proposed transmission line from greater distances would be available to motorists and residents south along Nance Springs Road as the route assumed a parallel course along the CSX Railroad right-of-way. These views would include the transmission line against a background of vegetation that sparsely lines the railway. Occasional views would be available from the east to private landowners from the agricultural fields beyond the railway. Vegetation farther south along Nance Springs Road would limit views to motorists and residents as the proposed transmission line neared the Conasauga River crossing point.

Within this section of the route, there are few vantage points from which the proposed transmission line may be seen. Although views would be open to greater distances, the number and duration of views available would generally be quite low. Upon reaching the SR 136 crossing point, the transmission line would again be visible from within the foreground viewing distance to residents and motorists traveling the roadway. The views of steel-pole structures and the transmission line would remain similar in context to the existing wooden-pole structures and transmission/distribution lines that are presently visible from similar positions. Views in the vicinity of the SR 136 crossing would dissipate as the proposed transmission line entered dense forestland to the south. Available viewing positions would be from the length of the transmission line only as it neared its second river crossing point.

Upon crossing the Conasauga River again, views of the transmission line would open to residents along Fite Bend Road. These views would be available from varying positions within the foreground viewing distance. The vegetation that lines the Conasauga River banks would be seen in the background of the proposed transmission line right-of-way, and views from the east would generally not be available. As the proposed transmission line continued southward, available views would decrease due to existing land-use patterns within the narrow strip of land between the Conasauga and Oostanaula rivers. Views would be available intermittently and through vegetation for those residents in the vicinity of Craigtown Road and would vary with seasonal variations in foliage. As the proposed transmission line crossed the Conasauga for the final time, views would be limited to the few private landowners to the east and those recreational river users who would view the transmission line on an oblique angle from between structures. Existing mature vegetation would limit views as the transmission line reached SR 225, where motorists would have brief views of the transmission line from between structures. Views of the transmission line would be similar in context to those of the existing distribution line that is presently visible along the roadway within this section.

Views available within the final segments of the proposed transmission line would be limited. Frequency and duration of view would be low due to the existing land-use patterns in the lowland areas around the Coosawattee River. Views available to private landowners would be available from within the foreground distance intermittently through mature vegetation to the north and south of the river. These views would vary depending on seasonal variations in foliage. Reaching the existing north/south transmission line right-of-way, available views would remain consistent to the viewer groups previously mentioned. Views of the steel poles and transmission lines would be similar in context to those of the existing transmission lines and structures visible to the north and south.

The proposed transmission line would span lowland areas, agricultural fields, and sparsely developed rural residential areas in Whitfield and Gordon counties. It would cross secondary and rural roadways in several locations. River crossings would be limited and

would occur perpendicular or at shallow oblique angles to the river. In many locations, the proposed transmission line would be obscured from view or would be viewed in context with existing transmission/distribution lines. Temporary visual discord associated with the construction of this proposed transmission line project would be probable, as residents and motorists would have views of increases in personnel and equipment as well as the creation and use of access roadways and material and equipment staging areas. These impacts to the existing landscape character associated with the construction phases of the project would be temporary in nature and would not result in a prolonged adverse impact. The proposed project would also result in the incremental addition of the number of contrasting vertical elements in the landscape and approximately 15.5 miles of transmission line. However, the changes that would be discernable from the viewing positions described in Section 3.10 at the conclusion of the construction phases would not contribute to a substantial loss of the existing landscape character and scenic value. Direct, indirect, and cumulative impacts to visual resources associated with the proposed transmission line and substation project would be insignificant.

4.11. Recreation, Parks, and Managed Areas

As a result of the proposed project, natural areas would be directly affected by the loss of forested areas within the proposed transmission line right-of-way. Potential erosion and resulting sediment transport to the river as a result of clearing and construction activities on the proposed right-of-way could directly and indirectly affect areas within the vicinity of the transmission line that would cross the Conasauga River. Additionally, because the proposed project would occur in phases over a span of two years, the opportunity for sediment transport to occur would be spread out over time. Therefore, the potential for project-related cumulative versus short-term effects as a result of sedimentation would be increased and could have the potential to adversely impact various mussel species and other aquatic organisms present, as well as the overall health of the river, as a result of habitat degradation.

Due to the location of the proposed transmission line and the existing level of development in the project vicinity, the proposed action would not affect the NRI status of the Oostanaula and Conasauga rivers or the recreation use on the three rivers adjacent to the proposed project. Due to the NRI status, TVA consulted with NPS regarding the proposed construction and maintenance activities at these three river crossings. Because of the potential for the proposed project to affect an NRI river and because this drainage has numerous federally listed and state-listed species (Section 3.7), stream protection measures and BMPs would be implemented to stabilize and contain sediment and/or debris to avoid erosion and sediment-laden runoff entering the streams in the project area (Sections 4.4 and 4.7). Furthermore, forested areas that would be cleared would be limited to areas within the right-of-way and adjacent trees considered as danger trees. The loss of this forested area is considered insignificant and would not significantly affect any managed/ecologically significant areas. In a letter dated June 20, 2007 (Appendix I), the NPS concurred with TVA's determination that with these protective measures, the proposed action is not anticipated to significantly impact the Conasauga River or any of the other managed/ecologically significant areas located within 3 miles of the proposed project.

Because the project would not impede traffic on SR 225, it would not impact the use of the Cherokee Indian Memorial, Echota Historical Site, or the boat ramp at Fork Ferry Bridge. Any impacts to other public recreation resources, facilities, and activities are anticipated to be temporary and insignificant.

4.12. Cultural Resources

The views to the proposed transmission line corridor from WD-716 and WD-718 were already compromised by existing transmission lines, roads, or new construction. The view from Sites WD-717, HS-6, GO-201, GO-202, HS-11, and HS-12 to the proposed transmission line corridor is obscured by mature tree growth and/or the position or distance. HS-16 and HS-17 are already in view of an existing transmission line, which the proposed transmission line segment would parallel. Therefore, the proposed undertaking would not introduce any new effects to the resources. HS-14 and the section of Old Dixie Highway would not be adversely affected due to the fact that numerous utility corridors already pass over the rail bed and road and neither would be physically disturbed.

Site 9WD149, an abandoned section of the historic Western & Atlantic Railroad bed with Civil War affinities, was recommended as potentially eligible for NRHP listing. As a result, TVA designed the transmission line so that no transmission line structures or access roads would be placed on or across Site 9WD149. With these design measures, no transmission line construction or maintenance activities would affect 9WD149. Of the remaining archaeological sites, four (9GO263, 9GO265, 9GO266, and 9GO269) were recommended ineligible for listing on the NRHP and the NRHP status of 22 is unknown, because they were not investigated beyond the project boundaries.

New Echota Historic Site is currently listed on the NRHP; however, the proposed transmission lines would be visible only from the far eastern edge of the property, which is outside of the area of historic events. TVA determined that the proposed transmission line would not adversely affect New Echota Historic Site's viewshed, because it would not alter, directly or indirectly, any of the characteristics that qualify the property for inclusion on the NRHP in a manner that would diminish the integrity of the property. TVA sought comments from the Georgia SHPO, federally recognized affiliated Indian tribes, NPS, and GDNR (New Echota State Park site manager). TVA determined in consultation with the SHPO and other interested parties that the proposed undertaking would not adversely affect any historic properties on or eligible for listing to the NRHP. In a letter dated June 20, 2007 (Appendix I), the GA SHPO concurred with TVA's determination. Pursuant to 36 CFR 800.5(c)(1), TVA has satisfied its obligations under Section 106 of the National Historic Preservation Act.

4.13. Post-Construction Impacts

4.13.1. Electric and Magnetic Fields

TVA recognizes there is public concern about whether any adverse health effects are caused by electric and magnetic fields (EMF) that result from generation, transmission, distribution, and use of electricity. Many scientific research efforts and other studies examining the potential health and other effects of EMF have been and are being done. TVA is aware of, and ensures that it stays aware of, published research and study results and directly supports some of the research and study efforts.

Studies, interpretations, and research to date are far from conclusive about potential associations between EMF and possible health impacts. A few studies have been interpreted as suggesting a weak statistical relationship between EMF and some rare forms of cancer. During the summer of 2001, the International Association for Research on Cancer reviewed available epidemiological studies and concluded that childhood leukemia appears to be associated with magnetic fields but that there was not a cause-and-effect

relationship. It was concluded that the risk is small but may in some circumstances of higher exposure result in one type of childhood leukemia. The association also concluded that electric fields do not have a connection with cancer.

However, equal or greater numbers of similar studies show no association or cannot reproduce data interpreted as demonstrating an association. No laboratory research has found cause-and-effect health impacts from EMF and certainly none that are adverse. Neither has any concept of how these fields could cause health effects achieved scientific consensus.

There is also no agreement in the scientific or EMF research community as to what if any electric or magnetic field parameters might be associated with potential health effects. There are no scientifically or medically defined safe or unsafe field strengths, although state regulatory bodies in Florida and New York have established edge of right-of-way magnetic field strength limits for 230-kV and larger power transmission lines.

TVA has analyzed and continues to analyze the fields associated with its typical line designs using the best available models and has measured actual fields for a large number of locations along its transmission line easements. Both model data and measurements show that the field strengths for TVA transmission lines are well within Florida and New York limits. Based on such models, expected field strengths for the proposed lines discussed in this document would also be within those existing state guidelines.

TVA's standard location practice has the effect of minimizing continuous public exposures to transmission line EMF. The transmission line route selection team uses a constraint model that places a 300-foot-radius buffer around occupied buildings, except schools, for which a 1,200-foot buffer is used. The purpose of these buffers is to reduce potential land-use conflicts with yard trees, outbuildings, and ancillary facilities and potential visual impacts as well as exposures to EMF. Although not absolute location constraints, these buffers weigh heavily in location decisions, influencing selection of route options and alignments. Because EMF diminishes quickly with distance from the conductors, the routing of transmission lines using constraint buffers effectively reduces potential continuous public exposure to EMF. Crossing under lines or otherwise being near them for short periods may increase overall EMF exposure, but only minutely.

4.13.2. Other Impacts

No significant impacts are expected to result from the relatively short-term activities of construction, such as noise, solid waste, etc. Appendices III and IV contain procedures for dealing with these issues.

4.14. Irreversible and Irretrievable Commitment of Resources

The materials used for construction of the proposed facilities would be committed for the life of the facilities. Some materials, such as ceramic insulators and concrete foundations, may be irrevocably committed, but the metals used in equipment, conductors, and supporting steel structures could be recycled. The useful life of steel-pole transmission structures is expected to be at least 60 years.

The rights-of-way used for the transmission lines would not be irreversibly committed and could be returned to other uses upon retirement of the line. In the interim, compatible uses of the right-of-way could continue.

Forest products and related wildlife that might have grown on the presently forested portions of the right-of-way would be lost for the life of the project. No locally or regionally significant lost forest or agricultural production would be expected.

4.15. Unavoidable Adverse Effects

As previously stated, clearing for the Moss Lake Substation and the associated transmission line connections would result in the removal of approximately 87 acres of forest. After completion of the substation and transmission line:

- The substation location would be graveled. Trees would not be permitted to grow within the transmission line right-of-way or to a determined height adjacent to the right-of-way that would endanger the transmission line.

- Clearing and construction would result in the disruption of some wildlife, but no long-term habitat changes would occur except in the wooded areas previously described and on the substation site.

- Any burning of cleared material would result in some short-term air pollution.

- Clearing, tree removal, and excavation for pole erection and substation construction would result in a small amount of localized siltation.

- Transmission line and substation visibility would be minimized through the location; however, there would be some degree of visual effect on the landscape in the project area.

4.16. Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity

The construction and operation of the proposed transmission line would supply electricity to meet the present and foreseeable expected loads at the planned Moss Lake Substation. This would be accomplished by a localized shift of a small amount of land to use for electric power transmission. If, during the useful life of the transmission line, it is no longer needed or technology renders it obsolete, it can be removed with relatively little difficulty. The land encumbered by the right-of-way could be returned to its previous use or used for other purposes.

The principal change in short-term use of the right-of-way would be the exclusion of trees and permanent structures. The amount of forest being lost is approximately 87 acres within the right-of-way area, and areas removed from production are dispersed along the length of the transmission line. The right-of-way cannot support building construction for the life of the project, but the social and economic benefits of the project should outweigh this small loss.

4.17. Summary of TVA Commitments and Proposed Mitigation Measures

To support the preceding conclusions, TVA would commit to the following additional actions to avoid or mitigate possible environmental impacts:

Groundwater Protection

- During transmission line revegetation and maintenance activities, application of fertilizers and herbicides would not be applied in areas that flow to groundwater infiltration zones (i.e., springs, wells, and sinkholes). Additionally, herbicides with groundwater contamination warnings would not be used in the areas surrounding the cave entrances located within the proposed transmission line right-of-way.

- The proposed Moss Lake Substation would have spill containment within the substation site, and all storm water would be captured by an oil and water separator before flowing from the site. Herbicides would not be applied within the area that drains the south side of the proposed substation to avoid impacts to the groundwater recharge area.

Protection of Aquatic Resources

- Category B protections would apply in the Conasauga drainage to perennial streams crossed by the proposed transmission line. As defined in Muncy (1999), a minimum 200-foot SMZ would be established with a 100-foot riparian buffer on each side of the stream (Appendix VII). Construction of temporary stream crossings in these areas is prohibited. The buffer, when possible, would be retained in or planted to native vegetation of at least shrub size.

- Category A protection would apply in the Conasauga drainage to intermittent streams. A 50-foot SMZ would be implemented on both sides of these crossings. Some vegetation within these buffer zones may be temporarily disturbed if culverts, fords, or other temporary stream crossings are necessary, but stream banks would be restored to normal contours and stabilized after the temporary crossing is removed. The buffer, when possible, would be retained in or planted to native vegetation of at least shrub size.

- Fallen or cut trees would be left in place, when possible, in the buffer zone. Trees that must be cleared will be removed with a minimum of ground disturbance (e.g., winched out using heavy equipment operating outside the buffer), and root systems will be retained in the ground.

- The transmission line right-of-way would be maintained on a minimum three-year schedule.

- All staging areas and equipment maintenance areas would be located at least 200 feet from stream habitats.

- Watercourses that convey surface water only during storm events (i.e., wet-weather conveyances or ephemeral streams) and that could be affected by the proposed transmission line route would be protected by standard BMPs as identified in Muncy (1999). These BMPs are designed in part to minimize erosion and subsequent sedimentation in streams.

Cave Ecosystem Protection

- A 200-foot buffer around each cave entrance would be established, and the current vegetation would be maintained to the tallest height appropriate for the proposed transmission line. Vegetation would be hand cleared only, and vehicles and equipment would be restricted unless confined to an existing access road.

Wetlands

- To compensate for the adverse impacts to wetlands, mitigation credits would be purchased as determined by the Savannah District USACE at the Oostanaula River Bank in Floyd County, Georgia, or another qualifying bank as determined by USACE.

Hazardous Waste

- Two houses located within the proposed transmission line right-of-way would need to be removed. Before removal, these houses would undergo a full evaluation to determine if they contain or are constructed with any material that is hazardous or otherwise regulated under CERCLA, RCRA, or other state or federal laws or regulations. If any such material is present, it would be handled and disposed of pursuant to the applicable regulations.

General Best Management Practices for Clearing, Construction, and Maintenance

- TVA practices detailed in Appendices II, III, IV, V, and VI would be used during clearing, construction, and maintenance. EO 13112 directs all federal agencies to prevent and control the introduction and spread of invasive species resulting from their activities. TVA would use reseeding mixes that are certified free of invasive, exotic plant seeds when replanting disturbed areas.

Page intentionally blank

CHAPTER 5

5. SUPPORTING INFORMATION

5.1. List of Preparers

Hugh S. Barger

Position:	Environmental Engineering Specialist, TVA Power System Operations, Chattanooga, Tennessee
Education/Experience:	B.S., Engineering; 34 years in Transmission Line Planning and Preparation of Environmental Review Documents
Involvement:	Purpose of and Need for Action; Alternatives Including Proposed Action

John T. Baxter

Position:	Senior Aquatic Biologist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	M.S. and B.S., Zoology; 17 years in Protected Aquatic Species Monitoring, Habitat Assessment, and Recovery; 7 years in Environmental Review
Involvement:	Aquatic Endangered Species

W. Nannette Brodie

Position:	Senior Environmental Scientist, TVA Research & Technology Applications, Chattanooga, Tennessee
Education/Experience:	B.S., Geology, B.S., Environmental Science; 12 years in Environmental Analyses, Surface Water Quality and Groundwater Assessments; Registered Professional Geologist
Involvement:	Groundwater

Patricia B. Cox

Position:	Senior Botanist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	Ph.D. Botany, 28 years in Plant Taxonomy at the University Level; 2 years in Botanical Field Assessments
Involvement:	Vegetation, Threatened and Endangered Species

Jenny K. Fiedler

Position:	Terrestrial Zoologist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	M.S., Wildlife Science; B.S., Biology-Environmental Emphasis; 8 years in Field Biology; 3 years in NEPA Compliance
Involvement:	Wildlife, Threatened and Endangered Species

James P. Groton

Position:	Contract Wetlands Biologist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	M.S., Forestry; B.S., Natural Resources; 27 years in Environmental Impact Assessment; 16 years in Wetlands Assessment and Delineation
Involvement:	Wetlands

Heather M. Hart

Position:	Natural Areas Contractor, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	M.S. Environmental and Soil Science, B.S. Plant and Soil Science (Water Quality); 4 years in Soil Assessment and Surface Water Quality Monitoring/Analysis, 3 years in Environmental Review
Involvement:	Natural Areas

John M. Higgins

Position:	Water Quality Specialist, TVA River Operations, Chattanooga, Tennessee
Education/Experience:	Ph.D., Environmental Engineering, B.S. and M.S., Civil Engineering; 31 years in Water Resource Management; Registered Professional Engineer
Involvement:	Surface Water

George M. Humphrey

Position:	Land Use and Recreation Specialist, TVA Environmental Stewardship, Lenoir City, Tennessee
Education/Experience:	M.S., Natural Recreation Resources Planning; B.S., Forestry; 31 years in Recreation Resources Planning
Involvement:	Recreation

Clint E. Jones

Position:	Biologist-Aquatic Ecologist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Education:	B.S., Wildlife and Fisheries Science; 15 years in Environmental Consultation and Fisheries Management
Involvement:	Aquatic Ecology

Anita E. Masters

Position:	Senior NEPA Specialist, TVA Environmental Stewardship and Policy, Chattanooga, Tennessee
Education/Experience:	M.S., Biology/Fisheries, B.S., Wildlife Management; 20 years in Fisheries Biology/Aquatic Community and Watershed Assessments, Protected Aquatic Species and Habitat Monitoring, and NEPA Compliance
Involvement:	NEPA Compliance and Document Preparation

P. Alan Mays

Position:	Environmental Scientist, TVA Research & Technology Applications, Knoxville, Tennessee
Education/Experience:	B.S., Plant and Soil Science; 30 years in Soil-Plant-Atmospheric Studies
Involvement:	Noise; Prime Farmland

Roger A. Milstead

Position:	Manager, TVA Flood Risk and Data Management, Knoxville, Tennessee
Education/Experience:	B.S., Civil Engineering; 30 years in Floodplain and Environmental Evaluations; Registered Professional Engineer
Involvement:	Floodplains

David T. Nestor

Position:	Contract Biologist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	M.S., Botany; B.S., Aquaculture, Fisheries, Wildlife Biology; 2 years in Threatened and Endangered Plant Species and Rare Habitats Surveying
Involvement:	Terrestrial Ecology (Terrestrial Plants); Threatened and Endangered Species (Terrestrial Plants)

Kim Pilarski

Position:	Senior Wetlands Biologist, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	M.S., Geography, Minor Ecology; 12 years in Wetlands Assessment and Delineation
Involvement:	Wetlands

Steve Pitt

Position:	Contract Siting Engineer, MESA, Inc., Chattanooga, Tennessee
Education/Experience:	B.S. Civil Engineering, 37 years in Civil Engineering
Involvement:	Project and Siting Alternatives

Jon C. Riley

Position:	Landscape Architect, TVA Environmental Stewardship and Policy, Muscle Shoals, Alabama
Education/Experience:	Bachelor of Landscape Architecture, Associate Member American Society of Landscape Architects; 8 years in Site Planning, Design, and Visual Resource Management
Involvement:	Land Use and Visual Resources

Marianne M. Shuler

Position:	Archaeologist Technician, TVA Environmental Stewardship and Policy, Knoxville, Tennessee
Education/Experience:	B.A., Religion/Middle Eastern Archaeology; 6 years in Archaeology
Involvement:	Cultural Resources

5.2. List of Agencies Consulted

Federal Agencies

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. National Park Service

State Agency

Georgia Office of Planning and Budget

5.3. Literature Cited

Bachtel, D.C., and S. R. Boatright. 1993. *The Georgia County Guide,* 12th edition. Athens: University of Georgia College of Agriculture and Environmental Sciences, Cooperative Extension Service.

Boschung, H. T., Jr,. and R. L. Mayden. 2004. *Fishes of Alabama*. Smithsonian Institution.

Bramlett, G. L., 1965. *Soil Survey of Gordon County, Georgia*. Washington: U.S. Government Printing Office.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. *Classification of Wetland and Deepwater Habitats of the United States.* Washington, D.C.: U.S. Fish and Wildlife Service, FWS/OBS-79/31.

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual*. Technical Report Y-87-1. Vicksburg: U.S. Army Corps of Engineers Waterways Experiment Station.

Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. *Turtles of the United States and Canada*. Washington, D.C.: Smithsonian Institution Press.

Etnier, D. A., and W. C. Starnes. 1993. *The Fishes of Tennessee*. Knoxville: University of Tennessee Press.

Georgia Department of Natural Resources. 1995. *Statewide Comprehensive Recreation Plan.*

———. 2006. *Georgia Natural Heritage Program*. Retrieved from <http://georgiawildlife.dnr.state.ga.us> (accessed September 2006).

Griffith, G.E., Omernik, J.M., and Azevedo, S.H. 1997. *Ecoregions of Tennessee*. Corvallis, Oregon: U.S. Environmental Protection Agency, EPA/600R-97/022.

James, W. 2002. *Non-Native, Non-Invasive Species Suitable for Public Use Areas, Erosion Control/Stabilization and Wildlife Habitat Plantings*. Unpublished.

Mack, J. J. 2001. *Ohio Rapid Assessment Method for Wetlands v. 5.0, User's Manual and Scoring Forms*. Ohio EPA Technical Report WET/2001-1. Columbus: Ohio Environmental Protection Agency, Division of Surface Water, 401/Wetland Ecology Unit.

Metee, M. F., P. E. O'Neil, and J. M. Pierson. 1996. *Fishes of Alabama and the Mobile Basin*. Birmingham: Oxmoor House, Inc.

Miller, J. A. 1990. *Groundwater Atlas of the United States*. Hydrologic Investigations Atlas 730-G. U.S. Geological Survey.

Muncy, J. A. 1999. *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities*, rev. ed. Edited by C. Austin, C. Brewster, A. Lewis, K. Smithson, T. Broyles, T. Wojtalik. Norris: Tennessee Valley Authority, Technical Note TVA/LR/NRM 92/1.

NatureServe. 2006a. "An Online Encyclopedia of Life." *NatureServe Explorer*: Plants. Retrieved from <http://www.natureserve.org/explorer> (accessed August 11, 2006).

———. 2006b. "An Online Encyclopedia of Life." *NatureServe Explorer*: Aquatics. Retrieved from <http://www.natureserve.org/explorer> (accessed July 2006).

North Georgia Regional Development Center. 2002. *Whitfield County and Cities Joint Comprehensive Plan Update: 2000-2020*. Retrieved from <http://www.ngrdc.org/compplans.html> (n.d.).

Parmalee, P. W., and A. E. Bogan. 1998. *The Freshwater Mussels of Tennessee*. Knoxville: The University of Tennessee Press.

Reed, P. B., Jr. 1997. *Revised National List of Plant Species That Occur in Wetlands: National Summary.* U.S. Fish and Wildlife Service Biological Report 88(24).

Rejmanek, M. 1989. "Invasibility of Plant Communities." Pages 369-388 in *Biological Invasions: A Global Perspective*. Edited by J. A. Drake, H. A. Mooney, F. di Castri, et al. New York: John Wiley and Sons.

Sehlinger, B., and D. Otley. 1980. *North Georgia Canoeing: A Canoeing and Kayaking Guide to the Streams of the Cumberland Plateau, Blue Ridge Mountains, and Eastern Piedmont*. Ann Arbor: Thomas Press.

Strand, M. N. 1997. *Wetlands Deskbook,* 2nd Edition. Washington, D.C.: The Environmental Law Reporter, Environmental Law Institute.

Sutherland, A. B., J. L. Meyer, and E. P. Gardiner. 2002. "Effects of Land Cover on Sediment Regime and Fish Assemblage Structure in Four Southern Appalachian Streams." *Freshwater Biology* 47:1791-1805.

Tennessee Valley Authority. 1983. *Instruction IX Environmental Review*. Retrieved from <http://www.tva.gov/environment/reports/pdf/tvanepa_procedures.pdf> (n.d.).

U.S. Army Corps of Engineers. 2004. *Standard Operating Procedure, Compensatory Mitigation, Wetlands, Open Waters, and Streams and Addenda*. Savannah Regulatory District. Retrieved from <http://www.sas.usace.army.mil/permit.htm> (n.d.).

U.S. Environmental Protection Agency. 2005. *Local Drinking Water Information*. Retrieved from <http://www.epa.gov/safewater/dwinfo/index.html> (n.d.).

U.S. Fish and Wildlife Service. 1985. "Endangered and Threatened Wildlife and Plants: Determination of Endangered Status and Critical Habitat for the Amber Darter and Conasauga Logperch." *Federal Register* 50(150): 31597-31604.

———. 1986. *Conasauga Logperch and Amber Darter Recovery Plan.* Prepared by Richard G. Biggins for U.S. Fish and Wildlife Service Southeast Region, Atlanta, Georgia.

———. 2003 "Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for Three Threatened Mussels and Eight Endangered Mussels in the Mobile River Basin; Proposed Rule." *Federal Register*: 50 CFR Part 17. 68:14752-14832.

———. 2004. "Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for Three Threatened Mussels and Eight Endangered Mussels in the Mobile River Basin." *Federal Register* 69(126):40083-40171.

Wild, M. J. 2006. Cultural Resource Survey for the Proposed Center Point-Moss Lake Transmission Line, Gordon and Whitfield Counties, Georgia. Report submitted to the Tennessee Valley Authority, Cultural Resources, Knoxville, Tennessee.